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MAR 15 1948

CIVIL ENGINEERING

MARCH

1948

SLUICE GATE CONTROL TOWER for TVA'S $30,000,000 Watauga Dam nears 300-ft final height. About half of total fill is now in place—700,000 cu yd of earth and 800,000 cu yd of rock. See story, page 20.

F[illegible] Building Construction Industry—Perry

Three-Year [illegible] Develop[illegible]—Taylor

Traffic Improvements Through Traffic Engineering—Smith

S. Military Government Completes Korean Water Supply System—Kirpich

ASCE SPRING MEETING—PITTSBURGH, PA.—APRIL 7–9, 1948

RAYMOND

Open-end pipe piles reaching to bedrock and filled with concrete solved the problem of foundation support for the B. C. Cobb Steam Plant of the Consumers Power Company at Muskegon, Michigan.

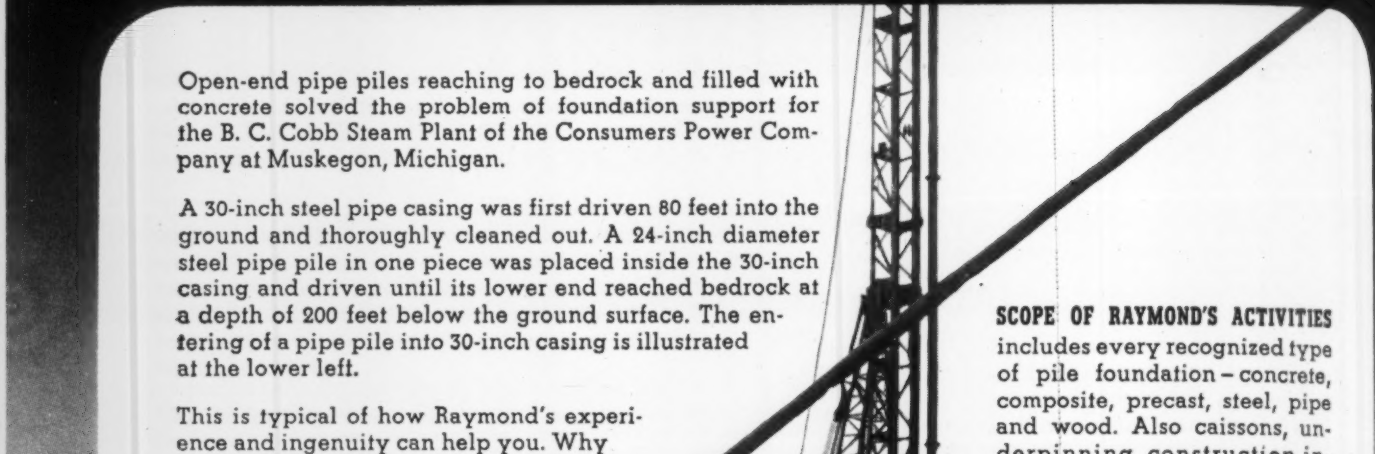
A 30-inch steel pipe casing was first driven 80 feet into the ground and thoroughly cleaned out. A 24-inch diameter steel pipe pile in one piece was placed inside the 30-inch casing and driven until its lower end reached bedrock at a depth of 200 feet below the ground surface. The entering of a pipe pile into 30-inch casing is illustrated at the lower left.

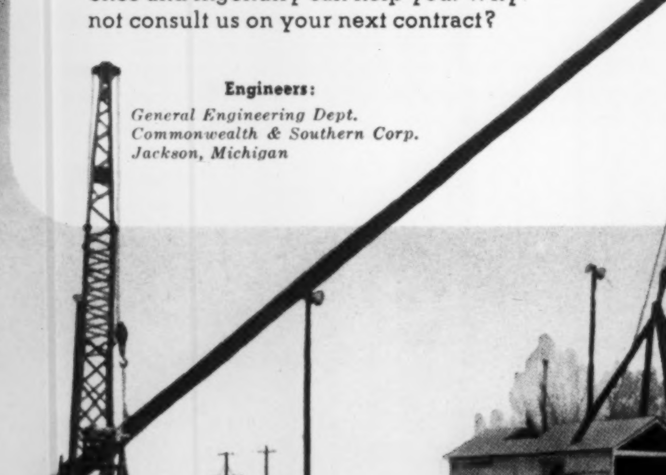
This is typical of how Raymond's experience and ingenuity can help you. Why not consult us on your next contract?

Engineers:
General Engineering Dept.
Commonwealth & Southern Corp.
Jackson, Michigan

SCOPE OF RAYMOND'S ACTIVITIES includes every recognized type of pile foundation – concrete, composite, precast, steel, pipe and wood. Also caissons, underpinning, construction involving shore protection, shipbuilding facilities, harbor and river improvements and borings for soil investigation.

51 YEARS FOUNDED 1897 OF PROGRESS





RAYMOND

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1948 Spring Meeting of ASCE

Pittsburgh, Pa., April 7–9, 1948

HOTEL WILLIAM PENN

Introduction to Pittsburgh, Wednesday, April 7

10:00 A.M. BALLROOM, HOTEL WILLIAM PENN

lcome by Pittsburgh Local Section

G. G. Greulich, President, Pittsburgh ocal Section; Consulting Engineer, arnegie-Illinois Steel Corp., Pittsburgh, a.

Progressive Pittsburgh

Hon. David A. Lawrence, Mayor of Pittsburgh.

Allegheny County Public Works

John E. Kane, Chairman, Allegheny County Commission.

Response

R. E. Dougherty, President of ASCE; Vice-President, New York Central System, New York, N.Y.

Motion Picture—"Pittsburgh, The Wonder City of the World."

Sessions of Technical Divisions, Wednesday Afternoon

Air Transport Division

2:15 P.M. ADONIS ROOM

siding: Alfred J. Ryan, Chairman, ecutive Committee, Air Transport Division

mposium: The Design Approach to Airport Terminal Facilities

roduction—Economic Survey and Justification

J. B. Bayard, Jr., Chairman, Subcommittee on Terminal Facilities of the Air Transport Division's Committee on Airport and Airways Planning; Director, Airport Division, Horner & Shifrin, Consulting Engineers, St. Louis, Mo.

ilding Area, Structures and Facilities

G. Meredith Musick, Denver, Colo.; Member, Subcommittee on Terminal Facilities.

gram Development

H. P. Beach, Jr., Member, Subcommittee on Terminal Facilities; Chief Architect, Airways Engineering Consultants, nc., Washington, D.C.

scussion

anitary Engineering Division

2:15 P.M. URBAN ROOF

Presiding: Harry M. Freeburn, Chairman, Executive Committee, Sanitary Engineering Division

Western Pennsylvania Pollution Abatement Program

Elmer A. Holbrook, Dean, School of Engineering and Mining, University of Pittsburgh; Member, Pennsylvania Sanitary Water Board, Pittsburgh, Pa.

Allegheny County Sanitary Authority Sewerage Project

John F. Laboon, Chairman, Allegheny County Sanitary Authority; Consulting Engineer, Pittsburgh, Pa.

Discussion

Frank L. Flood, Metcalf & Eddy, Boston, Mass.

Waste Pickle Liquor Neutralization

Richard D. Hoak, Senior Fellow, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Wednesday Social Activities

MEMBERSHIP LUNCHEON—12:15 P.M.

PITTSBURGH ROOM,
HOTEL WILLIAM PENN

Admiral Ben Moreell, Hon. M. ASCE, President, Jones & Laughlin Steel Corp., will speak on "The Engineer and the Future."

EXCURSION AND LUNCHEON FOR WOMEN

Leave hotel at 10:30 a.m. to visit Buhl Planetarium, Heinz Chapel, and Commons of Nationality Rooms. Luncheon at University Club

DINNER-DANCE, WILLIAM PENN BALLROOM

6:00 p.m. **Cocktail Hour**

7:00 p.m. **Dinner**

Cal Tinney, nationally known commentator on current events.

9:30 p.m. **Dancing—Social Hour**

(Dress Optional)

Structural Division

2:15 P.M. CARDINAL ROOM

Presiding: John I. Parcel, Chairman, Executive Committee, Structural Division

Fundamental Effects of Welding

Leon C. Bibber, Welding Engineer, Carnegie-Illinois Steel Corp., Pittsburgh, Pa.

Discussion

F. H. Dill, Welding Engineer, American Bridge Co., Ambridge, Pa.

New Developments in Design of Light-Gage Steel

Tappan Collins, Detroit; Director of Research, Stran Steel Division, Great Lakes Steel Corp.

Discussion

Milton Male, Pittsburgh, Pa.; Director of Housing Research, U.S. Steel Corp. of Delaware.

End Connections for Streets Evaluated by States and Fatigue Tests on Aluminum Alloy Members

Marshall Holt and J. W. Clark, Research Engineers, Aluminum Co. of America, New Kensington, Pa.

Discussion

Sessions of Technical Divisions, Thursday Morning, April 8

Waterways Division

9:30 A.M. ADONIS ROOM

Presiding: Ralph L. Bloor, Chairman, Waterways Division Committee on Design, Construction and Operation of Navigation Locks and Dams

Gates and Bulkheads at Navigation Locks for Emergency Closures and Unwatering Operations

C. E. Blee, Chief Engineer, Tennessee Valley Authority, Knoxville, Tenn.

Construction Methods

Carlton B. Jansen, President Dravo Corp., Pittsburgh, Pa.

Influence of Model Testing in the Developing of Lock Hydraulic Systems

A. F. Griffin, Chief Engineer, Upper Mississippi Valley Division, Corps of Engineers, St. Louis, Mo.

Lock Sizes

Ralph L. Bloor, Chief, Engineering Division, Corps of Engineers, Washington, D.C.

Surveying and Mapping Division

9:30 A.M. CARDINAL ROOM

Presiding: J. S. Dodds, Chairman, Executive Committee, Surveying and Mapping Division

Pittsburgh City Survey

Charles B. Taylor, Director, Pittsburgh City Survey.

Cleveland Regional Geodetic Survey

G. Brooks Earnest, Consulting Director, Cleveland Regional Geodetic Survey.

Mapping Within Cities by Photogrammetric Methods

Virgil Kauffman, President, The Aero Service Corp., Philadelphia, Pa.

Discussion

Robert Randall, Executive Office of the President, Bureau of the Budg Washington, D.C.

Ford Bartlett, President, Lockwoo Kessler and Bartlett, Inc., Brookly N.Y.

Highway Division

9:30 A.M. URBAN ROOF

Presiding: Charles M. Upham, Pas Chairman, Executive Committee, Hig way Division

Symposium on Penn-Lincoln Highway, Pittsburgh, Pa.

Description and Object of Project

E. L. Schmidt, Harrisburg, Pa.; Chi Engineer, Pennsylvania Department Highways.

Downtown Interchange

George S. Richardson, Consultin Engineer, Pittsburgh, Pa.

Squirrel Hill Tunnel

Ole Singstad, Consulting Engineer New York, N.Y.

Discussion

Sessions of Technical Divisions, Thursday Afternoon, April 8

City Planning Division

2:15 P.M. ADONIS ROOM

Presiding: Lawrence V. Sheridan, Member, Executive Committee, City Planning Division

The Pittsburgh Master Guiding Plan

Frederick Bigger, Chairman, Pittsburgh City Planning Commission.

Development of Pittsburgh Central District

Wallace Richards, Executive Director, Pittsburgh Regional Planning Association.

Discussion

Organizing Regional Development in Allegheny County

Park H. Martin, Planning Engineer, Allegheny County Planning Committee, Pittsburgh, Pa.

Discussion

Construction Division

2:15 P.M. URBAN ROOM

Presiding: Elmer K. Timby, Executive Committee, Construction Division

Bluestone Dam, Hinton, W.Va.

Orval Auhl, Pittsburgh, Pa.; General Superintendent, Construction Division, Dravo Corp.

Discussion

Contracts and Specifications Relative to Highway Construction

D. W. Winkelman, President, D. W. Winkelman Co., Syracuse, N.Y.; President, Associated General Contractors of America.

Discussion

Edgewood Underpass, Penn-Lincoln Highway

S. L. Fuller, President, John F. Casey Co., Pittsburgh, Pa.

Discussion

Social Activities, Thursday, April 8

EXCURSION AND LUNCHEON FOR WOMEN

Leave hotel at 10:30 a.m.

Visit garden at Sewickley Heights.

Luncheon at Shannapin Country Club.

Fashion Show.

SMOKER, 6:00 P.M., PITTSBURGH ATHLETIC ASSOCIATION

EVENING SIGHTSEEING TOUR

Leave Pittsburgh Athletic Association 9:15 p.m.

Visit Golden Triangle, Jones-Laughlin (Southside Works) and Carnegie-Illinois (Homestead Works).

Excursion, All Day Friday, April 9

LEAVE WILLIAM PENN HOTEL 9:15 A.M.

Bus trip to points of interest en route t Homestead Works of Carnegie-Illinois Steel Corp.

Guided tour through plant

Luncheon at Bill Green's famous roadhouse

Trip to Irvin Works of Carnegie-Illinois Steel Corp.

Guided tour through plant

Hotel Accommodations

As an accommodation to members and guests at the Pittsburgh Spring Meeting the Arrangements Committee has set up a bureau to handle all hotel reservation requests.

Special attention will be given your request for accommodations at the Willia Penn Hotel, Meeting Headquarters, or any other hotel of your choice if it is mailed directly to the address that follows.

Mail all hotel requests to:

Mr. D. E. Davis, *Chairman*
Care, Pittsburgh Convention Bureau, Inc.
Chamber of Commerce Building
Pittsburgh 19, Pa.

Student Chapter Conference, Tuesday, April 6

URBAN ROOF, HOTEL WILLIAM PENN

9:30 **Registration, Ballroom Lobby**

10:00 **Welcome on behalf of Pittsburgh Section by**

F. S. Merrill, Chairman, Spring Meeting Committee on Student Activities; Division Engineer, American Bridge Co., Pittsburgh, Pa.

10:05 **Response by Chairman of Student Conference**

10:10 **Contest Symposium on Urban Express Highways**

11:30 **General discussion**

12:30 **Lunch, Pittsburgh Room**

For Student Chapter delegates, Local Section delegates, and the Board of Direction.

Speaker: R. E. Dougherty, President of ASCE, "The Young Engineer's Future in His Profession."

2:30 **What Makes a Student Chapter Tick?**

G. Brooks Earnest, Professor, Case Institute of Technology, Cleveland, Ohio; Past Chairman, Committee on Student Chapters.

3:15 **Discussion by Student Chapter delegates**

4:30 **Adjournment**

Arrangements Committee

G. G. Greulich, *President, Pittsburgh Section*
Charles M. Wellons, *General Chairman*
C. A. Keelen, *Vice-Chairman*
Frank W. Edwards, *Secretary, Pittsburgh Section*
Daniel E. Davis, *Chairman, Hotel Committee*
Myron G. Mansfield, *Chairman, Registration Committee*
C. Earl Webb, *Chairman, Technical Program Committee*
G. H. A. Parkman, Jr., *Chairman, Entertainment Committee*
F. S. Merrill, *Chairman, Student Activities Committee*
Samuel L. Fuller, *Chairman, Excursions Committee*
Mrs. W. F. Trimble, Jr., *Chairman, Women's Activities Committee*
Eugene N. Hunting, *Chairman, Reception Committee*
Lewis W. McIntyre, *Chairman, Publicity Committee*
Carlton B. Jansen, *Chairman, Finance Committee*
Donald L. Sommerville, *Chairman, Transportation Committee*
Leon A. Paddock, *Chairman, Local Section Contact Committee*

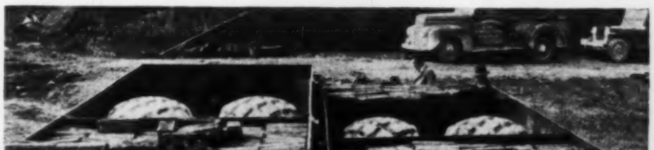
Super Compactor Cuts Airport Construction Costs

An ARTICULATED rubber-tired roller weighing 400,000 lb is cutting time and construction costs on the Baltimore Friendship Airport project. The super roller designed by O. J. Porter & Co., Sacramento, Calif., gives maximum compaction of soil to a depth of 6 ft.

The body of the compactor consists of two steel plate load boxes, each mounted on dual wheels and connected so as to allow oscillation for uniform compactive effort on uneven ground. Mammoth tires, 8 ft high and nearly 3 ft wide—manufactured by Goodyear Tire & Rubber Co.—are capable of carrying pressures up to 150 psi. The tires are mounted on dual wheels through the center of which is a 12-in.-dia, 3,000-lb steel axle. Combined weight of tire and tube is close to 1 ton.

A second super compactor is being shipped to Argentina for use on the new Buenos Aires airport.

SUPER COMPACTOR permits anticipated savings of close to $1,500,000 through elimination of extra rock otherwise required in subbase and through detection of soft spots in subgrade. Hydraulic jack is provided on back of compactor for raising box to change tires and for making static load tests.



STEEL BODIES of two load boxes comprising super compactor (above) are 20 ft long, 7 ft wide and 6 ft deep. Sides and bottom are built of $^3/_4$-in. steel plates reinforced on sides with 1-in. steel. Entire unit is welded. Ballast for load boxes consists of iron ingots weighing 80 lb each. Motive power (below) is supplied by 40,000-lb Allis-Chalmers tractor.

Planning the Watauga Project

A Flood Control and Power Project of the Tennessee Valley Authority

GEORGE K. LEONARD, M. ASCE
Project Manager, Watauga Project, TVA
Formerly Chief, Project Planning Division, TVA

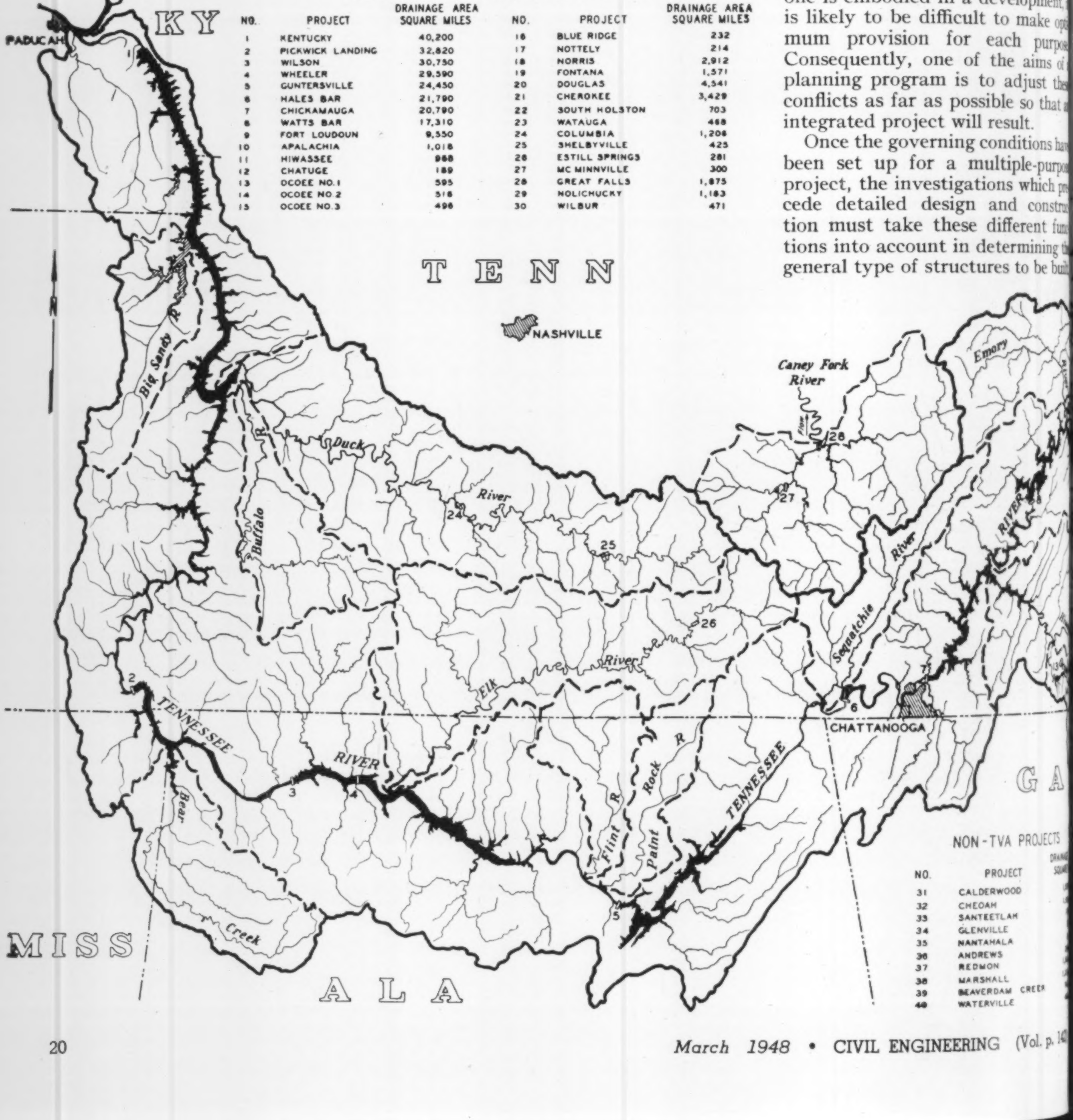
and

DON. H. MATTERN, M. ASCE
Head, Project Investigations
Section, TVA

CONSTRUCTION OF WATAUGA DAM was authorized by Congress in December 1941 as a war emergency project designed to augment the power supply in the Tennessee Valley. However, activity was halted about a year later by order of the War Production Board primarily because of a shortage of critical materials. Work was resumed in July 1946. Initial reservoir filling is now scheduled to start in December 1948, with operation of the first unit planned for the fall of 1949. This article outlines the planning investigations made prior to the construction of the Watauga Project, and will be followed in a later issue of CIVIL ENGINEERING by an article on the principal structures and some of the unusual construction features.

COORDINATED PLANNING is essential to comprehensive development of the water resources of an area like the Tennessee Valley. This is particularly true when development must provide for such divergent functions as malaria control, water supply, stream pollution, navigation, flood control, and power. The requirements for each function are somewhat different, so that whenever more than one is embodied in a development, it is likely to be difficult to make optimum provision for each purpose. Consequently, one of the aims of the planning program is to adjust these conflicts as far as possible so that an integrated project will result.

Once the governing conditions have been set up for a multiple-purpose project, the investigations which precede detailed design and construction must take these different functions into account in determining the general type of structures to be built



TENNESSEE VALLEY AUTHORITY PROJECTS

NO.	PROJECT	DRAINAGE AREA SQUARE MILES	NO.	PROJECT	DRAINAGE AREA SQUARE MILES
1	KENTUCKY	40,200	16	BLUE RIDGE	232
2	PICKWICK LANDING	32,820	17	NOTTELY	214
3	WILSON	30,750	18	NORRIS	2,912
4	WHEELER	29,590	19	FONTANA	1,571
5	GUNTERSVILLE	24,450	20	DOUGLAS	4,541
6	HALES BAR	21,790	21	CHEROKEE	3,429
7	CHICKAMAUGA	20,790	22	SOUTH HOLSTON	703
8	WATTS BAR	17,310	23	WATAUGA	468
9	FORT LOUDOUN	9,550	24	COLUMBIA	1,206
10	APALACHIA	1,018	25	SHELBYVILLE	425
11	HIWASSEE	968	26	ESTILL SPRINGS	281
12	CHATUGE	189	27	MC MINNVILLE	300
13	OCOEE NO. 1	595	28	GREAT FALLS	1,675
14	OCOEE NO. 2	516	29	NOLICHUCKY	1,183
15	OCOEE NO. 3	496	30	WILBUR	471

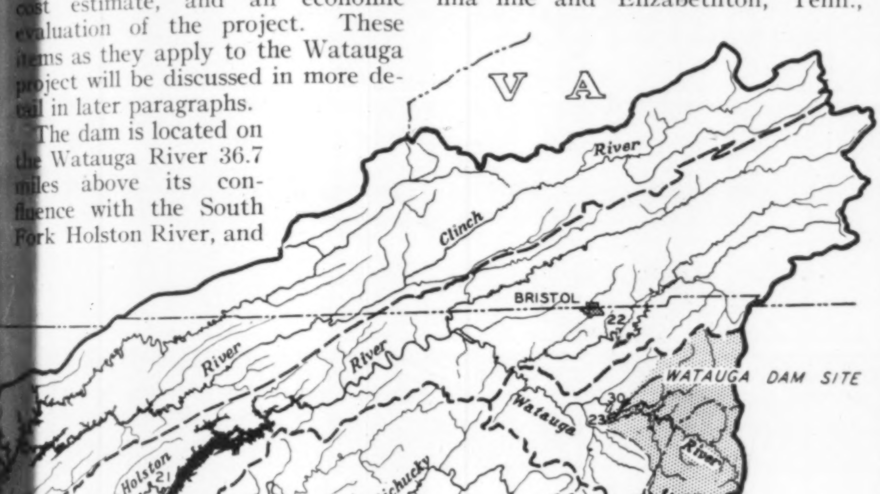
NON-TVA PROJECTS

NO.	PROJECT
31	CALDERWOOD
32	CHEOAH
33	SANTEETLAH
34	GLENVILLE
35	NANTAHALA
36	ANDREWS
37	REDMON
38	MARSHALL
39	BEAVERDAM CREEK
40	WATERVILLE

WATAUGA DAM SITE is in rocky gorge where Watauga River cuts through Iron Mountains near Elizabethton, Tenn. View is from reservoir level looking downstream.

the pool levels, spillway capacity, generating capacity, and necessary adjustments within the reservoir area. From these items it is obvious that planning of a major project entails the study of available basic geological, topographical, hydrological, and meteorological data, and the proper utilization of these fundamental facts. An important part of the planning activities consists of the preparation of a general layout, a quantity and cost estimate, and an economic evaluation of the project. These items as they apply to the Watauga project will be discussed in more detail in later paragraphs.

The dam is located on the Watauga River 36.7 miles above its confluence with the South Fork Holston River, and 179 miles above the head of the Tennessee River at Knoxville (Fig. 1). Although the river has a fall of about 600 ft in the 29 miles between the Tennessee-North Carolina line and Elizabethton, Tenn., and had been surveyed by several companies, only one small plant with an installed capacity of 3,700 kw had been built on the river. This plant, constructed in 1911, was acquired from the East Tennessee Light & Power Co. by the TVA in 1945.



BASINS

RIVER	DRAINAGE AREA AT MOUTH SQUARE MILES
TENNESSEE	40,910
BIG SANDY	629
DUCK	3,800
BUFFALO	764
BEAR CREEK	946
ELK	2,249
FLINT	568
PAINT ROCK	458
SEQUATCHIE	587
HIWASSEE	2,700
OCOEE	639
CLINCH	4,413
EMORY	865
LITTLE TENN	2,827
LITTLE	379
HOLSTON	3,776
WATAUGA	869
FRENCH BROAD	5,124
NOLICHUCKY	1,756
PIGEON	689

FIG. 1. DRAINAGE BASINS OF MAJOR TRIBUTARIES of Tennessee River cover area of 40,910 sq miles. Watauga Reservoir in extreme eastern end of valley is 829 river miles from, and about 1,650 ft higher than, mouth of river near Paducah, Ky.

Field investigations made as a part of an inventory of the water resources of the Tennessee Valley in the early days of the TVA established the possibility of developing a multiple-purpose project on the Watauga River in the general vicinity of Carden's Bluff, a prominent physical feature in the gorge where the river cuts through the Iron Mountains. When the need arose for more power for defense in 1941, the TVA was in a position to recommend this project.

Flood Control and Power Project

The principal functions of the Watauga development will be to provide flood control and to generate electric energy. Communities centering around the industrialized cities of Elizabethton and Kingsport and the small settlements along the Watauga and the South Fork Holston Rivers will receive the flood control benefits. The project also will be an important supplement to the existing Cherokee Reservoir as it will permit greater flexibility of operation in the control of floods for the benefit of Chattanooga and other areas. Watauga Dam, however, will have no effect on floods at Elizabethton which originate on the Doe River (Fig. 2). Additional electric energy will be added to the TVA system by generation at the Watauga powerhouse and also by regulation of stream flow to increase the useful output of downstream plants.

Watauga Dam will control the runoff from 468 sq miles. As Fig. 2 shows, the drainage area is roughly triangular and its eastern edge lies in the Blue Ridge Mountains which form the boundary of the Tennessee Valley at this point. The area is mountainous and much of it is covered with second-growth timber. Valleys are small and agricultural land is limited. The mean annual rainfall varies from about 45 to 55 in., of which roughly 45 percent reaches the river as runoff. This runoff amounts to approximately 1.6 cfs per sq mile, with a variation from dry years to wet years of about 0.9 to 2.0 cfs per sq mile.

Storms that cause the major general floods in the Tennessee Valley usually occur from December to March, originate in the Gulf of Mexico, and follow a path that is generally northeast in direction, thus subjecting the entire area to heavy precipitation. In addition, tropical storms traveling up the Atlantic coast during the summer and fall months frequently cross the mountains and cause intense rainfall over limited areas in the eastern part of the valley. It was a hurricane of this type which produced the maximum flood of record at the Watauga damsite in mid-August 1940. The flood had a peak discharge of 71,500 cfs, or 153 cfs per sq mile of drainage area, and would have been appreciably higher had Roan Creek, one of the chief tributaries, also been in flood.

Investigations of extreme flood rates within the Tennessee Valley and on other river basins of comparable size led to the decision to use a peak flow of 130,000 cfs in the design of the project structures. This flow, corresponding to 6,000 $\sqrt{\text{Drainage Area}}$, was approximately 80 percent greater than the flood of record. It is probable that a flood having such a peak rate of runoff at the Watauga damsite would be the result of a storm of the summer hurricane type, and wo have neither the volume nor t duration of a storm occurring du the winter or spring. The select design flood, consequently, was o of relatively short duration (2.5 da having a volume of about 225,0 acre-ft, or a runoff or 9 in. over t entire Watauga drainage area.

Design for Flood Control

Neither the physical characterist of the site nor the reservoir rim we major factors in determining t maximum controlled pool level. I vestigations of dam and reserv costs led to the selection of El. 1,9 as the maximum controlled pool lev At this elevation the total volume approximately 677,000 acre-ft. Flo control studies indicated that prote

FIG. 2. **WATAUGA DAM WILL CONTROL** runoff from 468 sq miles or slightly more than 50 percent of drainage basin of Watauga River. Chief flood control benefits will be received by industrial cities of Elizabethton and Kingsport, Tenn.

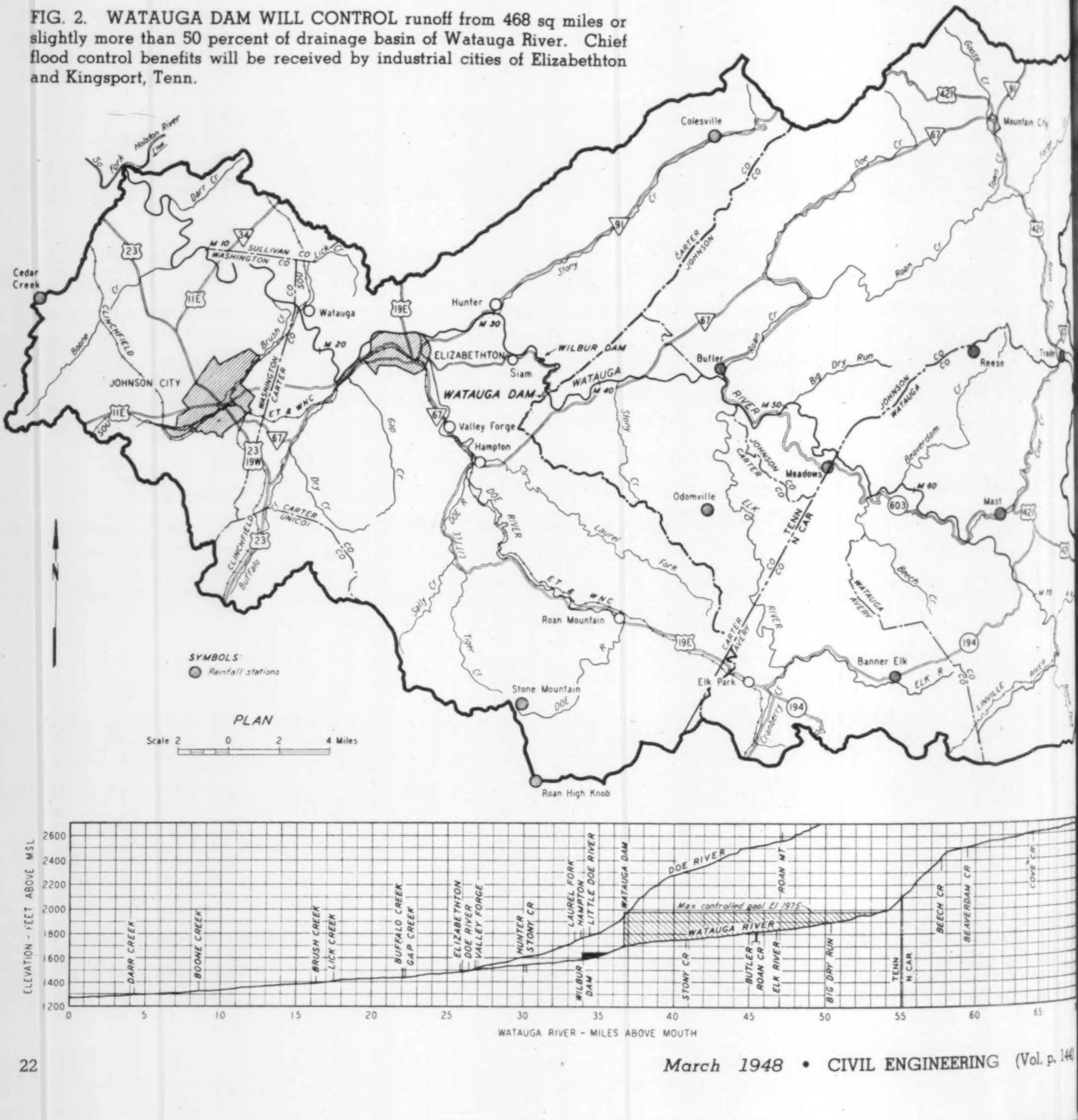
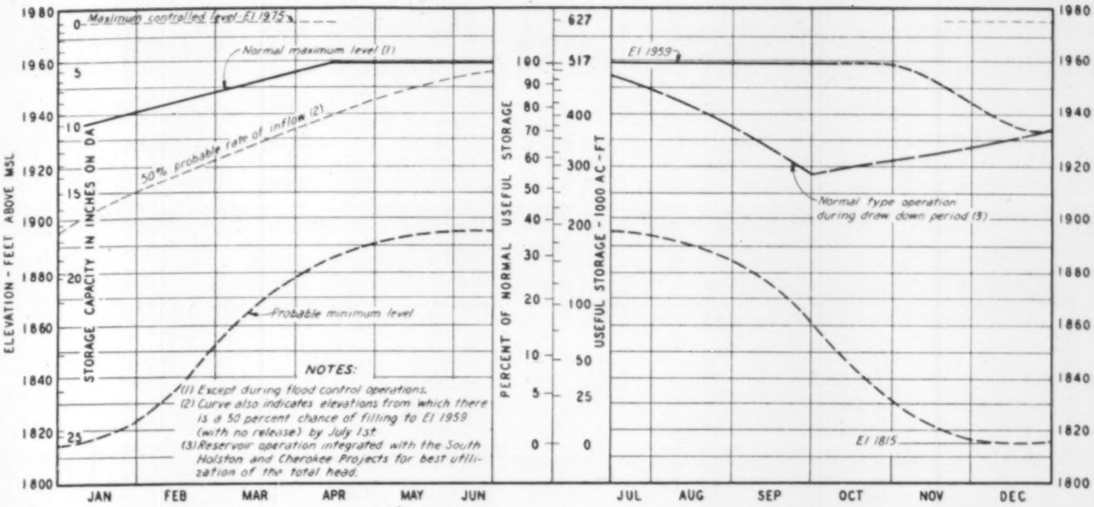

So. Fork Holston River
Darr Cr
Cedar Creek
Boone Cr
Clinchfield
Sullivan Co
Washington Co
M 10
23
34
11E
Watauga
19E
Brush Cr
Lick
M 20
Johnson City
Washington Carter
ET & WNC
Sou
67
23 19W
Gap Cr
Dry Cr
Carter Unicoi Co
Buffalo
Hunter
M 30
Elizabethton
Siam
Wilbur Dam
Watauga Dam
Valley Forge
Hampton
Colesville
Stony Cr
91
Carter Johnson Co
67
Butler
Roan Cr
Watauga River
M 40
M 50
Big Dry Run
Johnson Carter Co
Meadows
Odomville
Elk
Tenn N Car
Laurel Fork
Little Doe R
Doe River
Sally Cr
Tiger Cr
Roan Mountain
19E
Carter Avery
Elk Park
194
Cranberry
Stone Mountain
Doe R
Roan High Knob
Goose Cr
421
91
Mountain City
67
Doe Cr
Roan Cr
Johnson Watauga Co
Reese
Beaverdam Cr
M 60
603
Mast
421
Beech Cr
Watauga Avery
M 70
194
Banner Elk
Elk R
Linville River
N
SYMBOLS
Rainfall stations
PLAN
Scale 2 0 2 4 Miles
ELEVATION - FEET ABOVE MSL
2600
2400
2200
2000
1800
1600
1400
1200
Darr Creek
Boone Creek
Brush Creek
Lick Creek
Buffalo Creek
Gap Creek
Elizabethton
Doe River
Valley Forge
Hunter
Stony Cr
Laurel Fork
Hampton
Little Doe River
Wilbur Dam
Watauga Dam
Doe River
Max controlled pool El 1975
Watauga River
Stony Cr
Butler
Roan Cr
Elk River
Roan Mt
Big Dry Run
Tenn N Car
Beech Cr
Beaverdam Cr
Cove Cr
0
5
10
15
20
25
30
35
40
45
50
55
60
65
WATAUGA RIVER - MILES ABOVE MOUTH

FIG. 3. MULTIPLE-PURPOSE reservoir operation will provide adequate controlled storage at all times of year. At beginning of flood season on January 1, reservoir will have minimum of 260,000 acre-ft of controlled flood storage capacity—equal to about 10 in. of runoff from drainage area.



tion of Elizabethton and Kingsport against damaging floods from the Watauga River would require a minimum reservoir storage of 110,000 acre-ft, or an amount equivalent to a runoff of about 4 in. from the drainage area. Inasmuch as intense precipitation can be expected at any time during the year, this volume will be permanently reserved for flood control storage. Taking this reservation into consideration, the normal maximum level for multiple-purpose operation was set at El. 1,959.

Adequate reservoir volume likewise will be available for flood control storage at other times during the year. As noted from Fig. 3, the reservoir will start filling at an elevation not to exceed 1,934 as a maximum on January 1. From this elevation to El. 1,975, which is the spillway crest, there will be a controlled storage volume of 260,000 acre-ft. As indicated by the lowest curve, the reservoir may be drawn down during an extremely dry year to El. 1,815, in which case there would be a maximum storage volume of 627,000 acre-ft to absorb a flood.

However, except for temporary storage during flood, under no conditions will the reservoir be allowed to exceed the maximum multiple-purpose operating schedule between January and April 15. The allowable rate of filling usually will provide ample storage capacity for winter runoff. Table I shows the tentative multiple-purpose reservoir operation schedule, indicating reservoir elevations that are to be exceeded only during flood control operations, and the corresponding allowable useful storage content and controlled flood storage capacity available at these levels.

The record flood of mid-August 1940 could be entirely absorbed in the reservoir, while the peak discharge of the design flood would, according to routing studies, be reduced from 130,000 to 33,000 cfs. Assuming that two low-level sluices were kept open and that the maximum normal multiple-purpose operating level was El. 1,959 at the beginning of the flood, the maximum elevation reached during an occurrence of the design flood

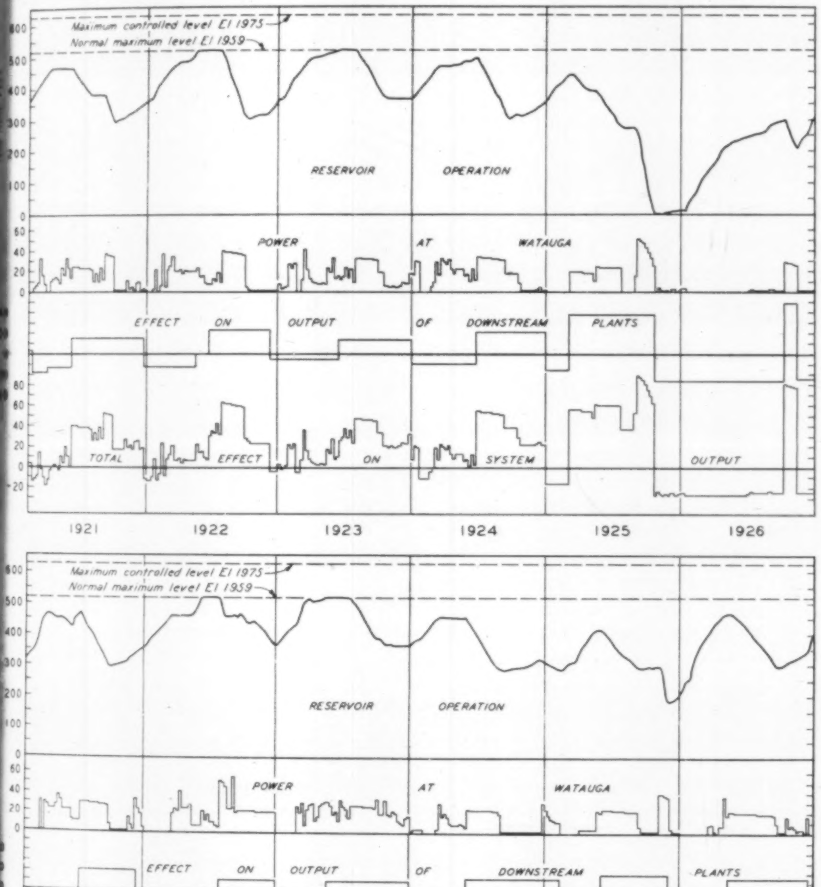


FIG. 4. TWELVE-YEAR PERIOD, 1921 to 1932, is used by TVA as typical runoff period for use in power studies. Typical reservoir operation and effect of Watauga power on system output is shown during this period of average flow.

TABLE I. TENTATIVE MULTIPLE-PURPOSE WATAUGA RESERVOIR OPERATION SCHEDULE

Date	Reservoir Elevation	Allowable Useful Storage Content, Acre-Ft	Controlled Flood Storage Capacity	
			Acre-Ft	Inches on Drainage Area
Jan. 1	1,934	368,000	258,000	10.3
Feb. 1	1,942	414,000	212,000	8.5
Mar. 1	1,949	454,000	172,000	6.9
Mar. 15	1,952	473,000	153,000	6.1
Apr. 1	1,956	499,000	127,000	5.1
Apr. 15	1,959	516,000	110,000	4.3
Normal maximum	1,959	516,000	110,000	4.3

would be 1,981.5, or 6.5 ft above the spillway crest. At this point, there would be a freeboard of 16.5 ft between the top of dam and the water surface. Should a future national emergency make it necessary to operate Watauga for maximum power production, this freeboard, with similar sluice operation, would be reduced to 11 ft.

Geology of Site

The Watauga River flows through a region underlain by siliceous pre-Cambrian and lower Cambrian rocks. At the Watauga project two lower Cambrian formations are involved, the Shady dolomite and the Unicoi quartzite and shale, the latter of very low metamorphic rank. The quartzite was originally sandstone which was changed by heat and pressure into an extremely hard and very brittle rock of variable composition. The beds of shale underwent some metamorphism which made them harder than most shales, but not enough to produce a typical slate. The Unicoi formation has been divided by the TVA geologists into 14 units for convenience in describing the various beds of rock encountered in the project structures.

The Iron Mountain fault, a major fault which has been traced from Virginia to the Nolichucky River, crosses the Watauga River near the intake tower and the morning glory for the spillway tunnel. At the damsite it has a vertical displacement of about 4,500 ft and a horizontal displacement of several miles. Brecciated regions are encountered near the fault, but they have apparently been thoroughly recemented. From cores drilled in the river area, it was determined that the deepest weathering of any consequence was about 4 ft below the top of rock, while rusty joints were found at a maximum depth of 20 ft below the rock surface. Chemical and physical analyses of cores taken from the foundation indicated that the rock can satisfactorily carry the load to be imposed upon it.

The topography of the Watauga damsite is well suited to the construction of a high dam. As may be seen from an accompanying photograph of the site, massive rock formations rising steeply on each side of the river gorge were ample for any type of dam chosen. Layouts and preliminary cost estimates were prepared for different types of dams during the planning stages of the project. Early consideration was given to a concrete gravity dam with the powerhouse located a short distance upstream from the site finally chosen for it; an earth and rockfill dam downstream from the present axis with its toe against Carden's Bluff; an earth and rockfill dam approximately 500 ft downstream from its present location with the powerhouse at the toe of the dam, and an excavated tailrace tunnel through the ridge; a concrete arch dam at the present site. Along with these dams, various locations for the powerhouse were investigated, as well as side-channel, overflow, and morning-glory types of spillways. All these layouts were found to be less economical than the one finally adopted.

Reservoir Adjustments

The dam will create a reservoir approximately 17 miles long with a shoreline of 109 miles. It will have a surface area of 7,100 acres at spillway-crest elevation and will flood about 6,800 acres, of which 80 percent has been cleared and is being used either for farming or pasture.

Of the approximately 650 families living within the reservoir area, 180 were in the small town of Butler, the first incorporated community to be inundated completely by a TVA reservoir in its 15 years of construction activity. It is interesting to note that many of the residents have joined to develop a new community in the same vicinity, but located above the maximum pool level. As part of its reservoir readjustment work, the TVA is assisting the townspeople in planning the new community. Appraisal of five small water-power properties was included in the planning as part of the development of an adequate cost estimate.

Relocation of transportation faci ties was confined to about 49 miles o state and county highway which wi replace the existing system of road within the reservoir basin. Ten mile of the 49-mile total is contained in th relocation of a main state highwa which at present runs along the valle floor through a large part of th flooded area. A branch of the South ern Railroad was washed out at man places during the August 1940 floods and was abandoned before the Wa tauga investigation program started.

Stream-Flow Regulation

Previous articles in Civil Engineering have described some of th TVA projects, particularly the main river plants. Main-river reservoir have a small amount of volume available for stream-flow regulation, bu headwater variations must be kep within close limits so as not to interfere with navigation on the Tennesse River. However, considerable storage can be placed economically i tributary reservoirs where it can b utilized in periods of low flow to increase the stream flow available fo power generation. Prior to completion of the navigable channel t Knoxville, this additional stream flo also was of considerable value i mintaining levels at which boats could more readily navigate.

Because the reservoir volume i large in relation to the available runoff from the drainage basin, it i advantageous to hold over a portio of this volume during years of averag stream flow for use during periods o deficient flow. Operating on such a basis, the reservoir would be only partially emptied in years of average runoff, holding enough water in storage to insure maximum allowable filling each year.

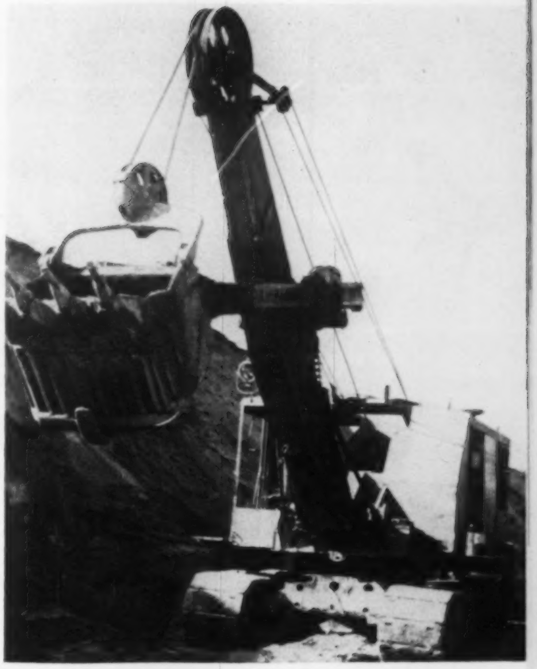
With this type of operation, a maximum amount of storage would be available to supplement the runoff during an extremely dry period Obviously, if the reservoir were operated on an annual-use basis, and drawn down to the minimum level each year, slightly more regulation could be accomplished in years o average runoff, but a smaller part o the total storage could be depended upon for use in a severe dry period.

With Watauga operated as a holdover-storage project, it would increase the potential primary output of the multiple-purpose system b 59,000 continuous kilowatts. Of this amount 21,500 kw would be developed at the Watauga powerhouse, and the other 37,500 kw at downstream plants from the release o

(*Continued on page 88*)

On-the-Job Equipment Maintenance Cuts Overhead Costs

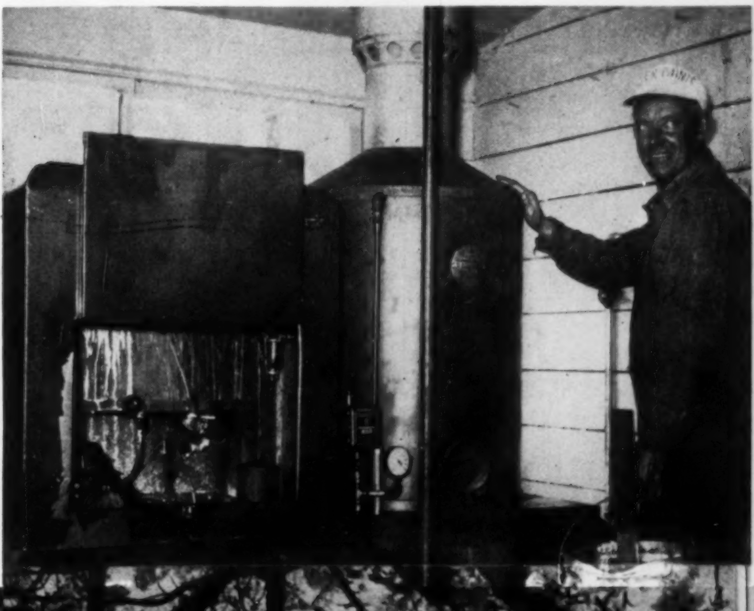
MINIMUM LAYUP TIME for heavy construction equipment operating at great distances from manufacturing and replacement centers pays large dividends to major contracting firms in the form of advanced completion dates and reduced overhead costs. Time and labor-saving facilities in the maintenance and repair shop are reported by the C. & F. Trucking & Contracting Co., Butte, Mont., to have accomplished this end. On work consisting mainly of highway construction, railroad grading and open-pit mining, a revamped maintenance and repair program is accounting for a full 25-percent saving in labor and is responsible for getting equipment back on the job in one-third less layup time. Accompanying illustrations show a few of the maintenance and repair expedients that have made this record possible.

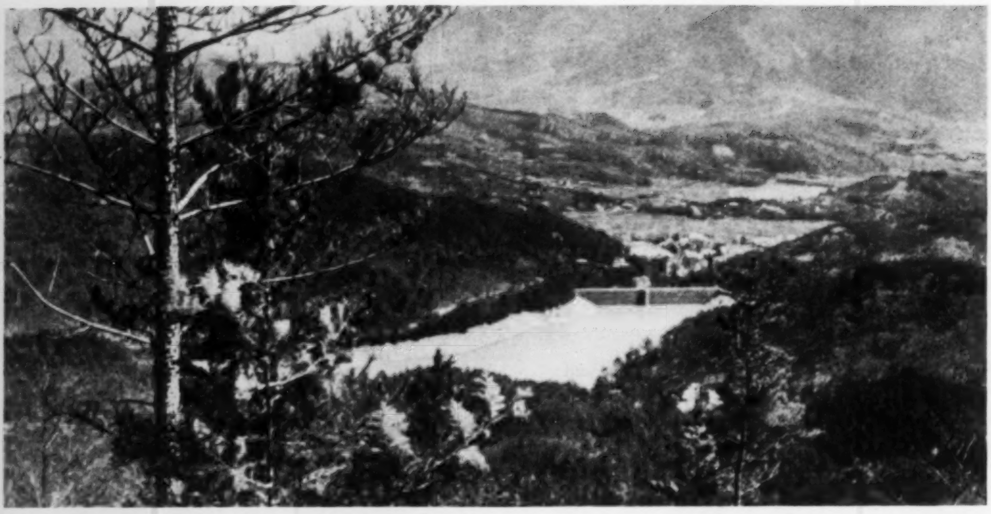


JOB-MADE BUCKET TEETH, weighing around 100 lb on 2-cu yd shovel, obviate delays in ordering new teeth and permit tailoring of teeth to suit particular type of excavation. Chrome alloy rod, 2½ in. in diameter, pointed and split half its length, is placed in forge, fitted to tooth stub and welded with stainless weld. Stubs of teeth that wear as much as 5 or 6 in. in single day's operation are rebuilt with new teeth points as many as 20 times.

WELDING PLAYS IMPORTANT ROLE in shovel, dragline and truck major overhaul operations. Cross-member breaks, frame breaks, dump-body fractures, fender breaks, water-jacket repairs, drive-shaft housings—all go to welder. Sheave groove (above, left) is built up to original depth and diameter by welding. Part is then machined down to smooth surface with exact measurements. Worn truck hub (above, right) is placed on positioner and built up by welding. Bearing cup is then machined down to exact shape and size.

COMPLETE STEAM CLEANING (below, left) is given to all major equipment before overhauling. Cleaning unit (below) has 10-gal solution tank and diesel fuel oil heating system. Cleaning of average steam shovel-dragline combination takes 10 gal of fuel oil and 5½ lb of commercial cleaning fluid. Steam cleaning reveals many failures during overhaul which otherwise would not be detected. In conjunction with steam cleaning, cold solution tank is used for cleaning motors, transmissions, rear-end parts, etc., before delivery to repair crew. Steam cleaning and cold solution tank also aid inspection of wire rope.





WATERSHEDS ABOVE IMPOUNDIN RESERVOIRS in Pusan, Korea, water supp system are well-managed forests. Wood i sold by City Water Department for produ tion of charcoal for fuel most used in hom for cooking.

U.S. Military Government Completes Korea Water Supply System Started by Japanese

PHILLIP Z. KIRPICH, ASSOC. M. ASCE

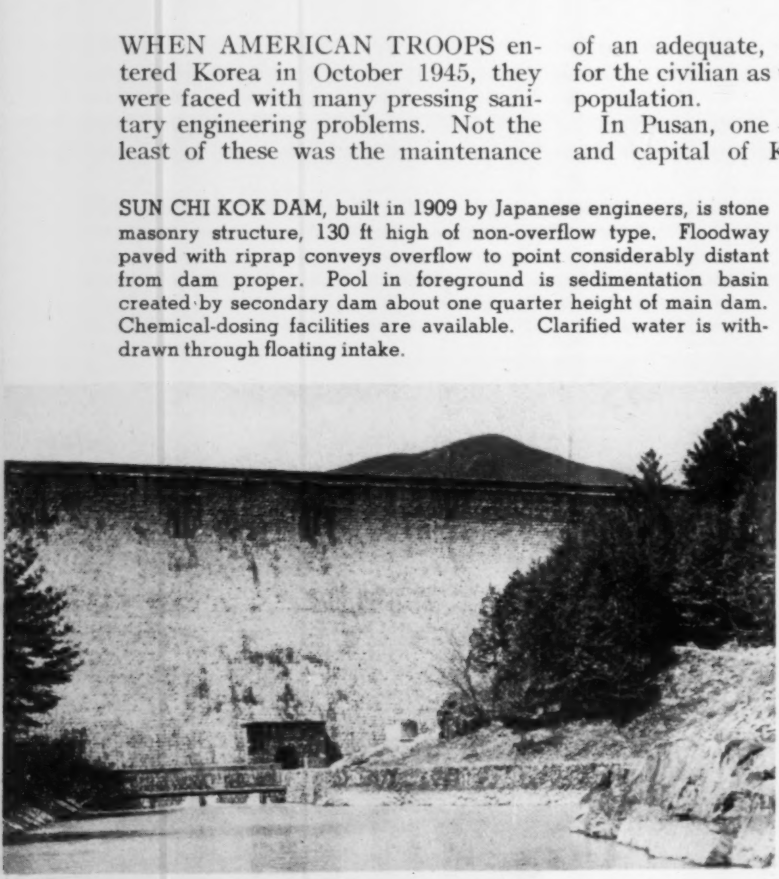
Hydraulic Engineer, Knappen Engineering Co.,
New York, N.Y.

WATER FOR PUSAN, Korea, taken from five impounding reservoirs, is treated in four plants. Of these, two use sedimentation and slow sand filtration, one utilizes slow sand filtration without pre-settling basins, and the fourth is of the rapid sand filtration type. In all cases, although plant effluent is chlorinated by makeshift feeders, the sanitary quality of the water is satisfactory. Started by the Japanese administration, the fourth treatment plant as well as development of the fifth source of supply was completed by the United States military government. During construction an emergency supply was furnished by pumping from a filtering intake. As the distribution system contains few hydrants and much small piping, secondary fire-fighting supplies are obtained from cisterns located throughout the city.

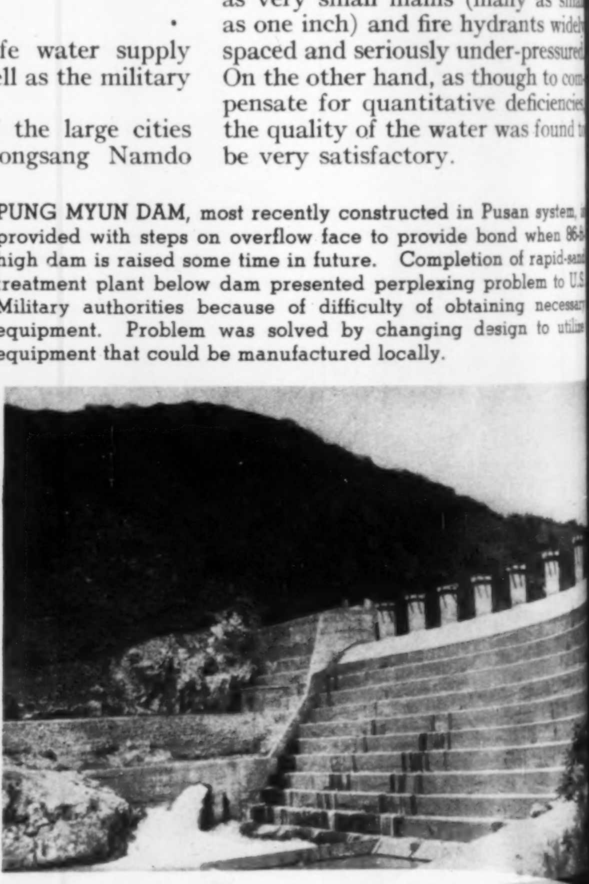
WHEN AMERICAN TROOPS entered Korea in October 1945, they were faced with many pressing sanitary engineering problems. Not the least of these was the maintenance of an adequate, safe water supply for the civilian as well as the military population.

In Pusan, one of the large cities and capital of Kyongsang Namdo Province, the water supply wa seriously inadequate. At that tim the per capita output was about 2 gpd, but because of leakage the con sumption was even less. In Sep tember 1945, with the output of th system far below demand, a progra of rationing, restricting use in a give area to three hours per day, was i force. In July 1946, developmen of a new source of supply was pa- tially completed, after which ration- ing was eased to the extent of pro- viding two additional hours of servic per day.

An examination of the distributio system revealed abnormalities suc as very small mains (many as smal as one inch) and fire hydrants widel spaced and seriously under-pressure On the other hand, as though to com- pensate for quantitative deficiencies the quality of the water was found t be very satisfactory.



SUN CHI KOK DAM, built in 1909 by Japanese engineers, is stone masonry structure, 130 ft high of non-overflow type. Floodway paved with riprap conveys overflow to point considerably distant from dam proper. Pool in foreground is sedimentation basin created by secondary dam about one quarter height of main dam. Chemical-dosing facilities are available. Clarified water is withdrawn through floating intake.



PUNG MYUN DAM, most recently constructed in Pusan system, i provided with steps on overflow face to provide bond when 86-f high dam is raised some time in future. Completion of rapid-san treatment plant below dam presented perplexing problem to U.S Military authorities because of difficulty of obtaining necessar equipment. Problem was solved by changing design to utiliz equipment that could be manufactured locally.

As shown in Fig. 1, the supply is drawn from five surface streams having a combined watershed area of only 27,550,000 sq m (10.6 sq miles). Except for pumpage from the Pung Myun Reservoir and a small amount from the Suyong River, the supply flows to the city by gravity. Treatment is entirely by slow sand filters, again with the exception of the Pung Myun supply, which is purified at a newly completed rapid sand filter plant. Following treatment, all water is fed to four service reservoirs and then into the distribution system.

SLOW SAND FILTRATION at Sun Chi Kok treatment plant is carried out in large basins. Filtration rate at this plant is limited by high turbidities to 2.5 mgd per acre compared with 5.3 mgd per acre used at considerably larger Bum U Sa plant.

Watershed Areas

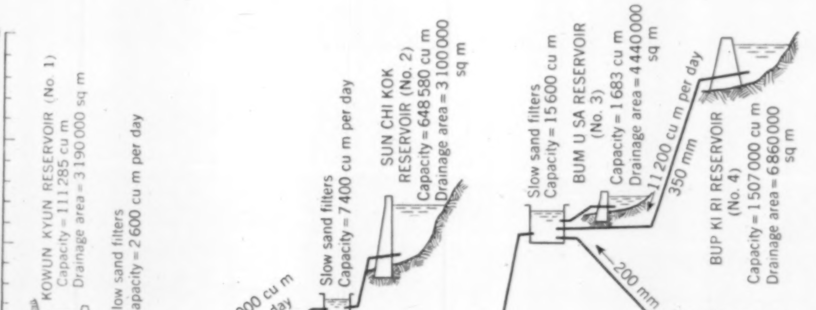
The watershed areas above the four high-level impounding reservoirs are almost entirely city owned and comprise a total area of 17,550,000 sq m (4,340 acres). These areas are mountainous and completely forested. Forest management is good, the city deriving a sizable revenue from the sale of wood, used in the production of charcoal, an important commodity in Korea. There is an annual ceremony comparable to our Arbor Day, at which time school children spend the day planting saplings on the watersheds. Although of doubtful practical value, this ceremony is a smart public relations measure.

A large part of the watershed above the Pung Myun Reservoir, 10,000,000 sq m in extent, is unfortunately not owned by the city. Much of the area drained is agricultural and devoted to the growing of rice. With the widespread practice of night-soil fertilization, the disease hazard is obvious.

Of the five dams in the system, two are of earth, two of stone masonry and one of concrete. The Sun Chi Kok Dam, shown in an accompanying illustration, a stone masonry non-overflow type of dam with a height of 40 m, is the highest of the five. Flood discharges are conveyed through a floodway paved with riprap which empties at a point considerably distant from the dam proper. A legend in English, carved in the stone parapet on top of the dam, states that the dam was built in 1909 and that Prof. E. Narajima of Tokyo was the consulting engineer.

The Pung Myun Dam, the most recently constructed, is a concrete gravity overflow dam 26.3 m high and 128.0 m long. The stepped construction on the overflow face, pictured herewith, is for the purpose of providing bond when the dam is raised at some time in the future.

The pipelines from the impounding reservoirs to the treatment plants and from the treatment plants to the service reservoirs in the city are of cast iron and vary in diameter from 340 to 450 mm, except in the case of the Pung Myun Reservoir. Here concrete pipelines varying in diameter from 450 to 700 mm are used.


200
150
100
50
0
KOWUN KYUN RESERVOIR (No. 1)
Capacity = 111 285 cu m
Drainage area = 3 190 000 sq m
Slow sand filters
Capacity = 2 600 cu m per day
225 mm
CITY OF PUSAN
5000 cu m per day
350 mm
Slow sand filters
Capacity = 7 400 cu m per day
SUN CHI KOK RESERVOIR (No. 2)
Capacity = 648 580 cu m
Drainage area = 3 100 000 sq m
450 mm – 10 000 cu m per day
Slow sand filters
Capacity = 15 600 cu m
BUM U SA RESERVOIR (No. 3)
Capacity = 1 683 cu m
Drainage area = 4 440 000 sq m
11 200 cu m per day
350 mm
BUP KI RI RESERVOIR (No. 4)
Capacity = 1 507 000 cu m
Drainage area = 6 860 000 sq m
200 mm
Pump station
Capacity = 2 780 cu m per day
Suyong R.
500 mm
15 000 cu m per day
700 mm
30 000 cu m per day
PUNG MYUN RESERVOIR (No. 5)
Capacity = 4 000 000 cu m
Drainage area = 10 000 000 sq m
Pump station
Capacity = 16 200 cu m per day
Rapid sand filters
Capacity = 14 500 cu m per day

G. 1. Two-thirds of supply of Pusan water system, shown in schematic diagram, is gravity. Suyong River supply, completed by U.S. Military Government, is pumped.

Treatment Plants

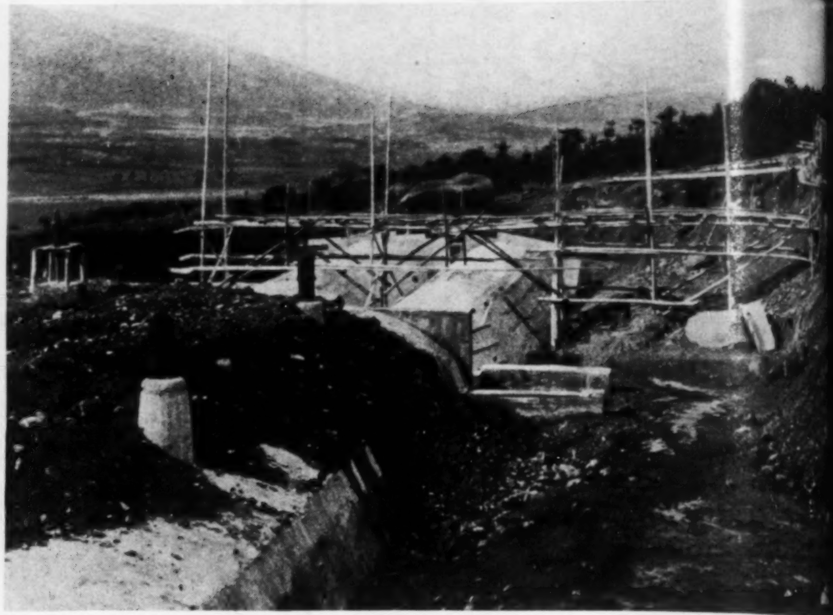
Table I summarizes facilities at the four treatment plants. As noted in the table, there is no sedimentation basin at the Kowun Kyun plant (No. 1). An effective system of by-passing prevents flood flows of relatively high turbidity from entering the reservoir at this plant, and therefore no sedimentation is needed. On the other hand, this system wastes large quantities of water needed during the dry season.

Sedimentation basins and facilities for adding coagulating chemicals are available at the Sun Chi Kok and Bum U Sa Plants (Nos. 2 and 3). However, as late as August 1946, no chemicals were available, although a shipment was expected shortly.

Chlorinating facilities consisted of Japanese gas chlorinators of a pulsating type. These were in poor condition and of inadequate capacity. Chlorination was of special importance on account of the danger of back-siphonage caused by negative pressures in the distribution system during the 19 hours in each day during which the supply was shut off. An outbreak of cholera occurred in the spring of 1946, making it imperative to intensify the chlorine dosage. Improvised chlorinators, shown in an accompanying illustration, were made and operated successfully.

The Suyong River Project

Cognizant of the severity of the water shortage, the Japanese authorities in Pusan had endeavored to complete the Suyong River Project. With diminishing intensity, work on this project proceeded almost until



TEMPORARY BYPASS PIPELINE (above, left) using second-hand asbestos-cement pipe is installed below Pung Myun Dam for purpose of maintaining dry river bed below dam. Dry river bed was used as filtering medium pending completion of rapid-sand filter plant. Clear-water reservoirs (above, right) are entirely covered. View shows uncompleted concrete reservoir in Suyong River system. More service reservoirs are needed in distribution system to eliminate low pressures in many parts of city.

the end of hostilities. When completed this source will yield 29,000 cu m per day (7.66 mgd) or almost twice the total output of the other parts of the system.

Soon after United States forces entered Korea it became evident that completion of the Suyong water project at Pusan was of first importance and would result in considerable prestige to both the U.S. Military Government and to the Koreans themselves if successfully accomplished.

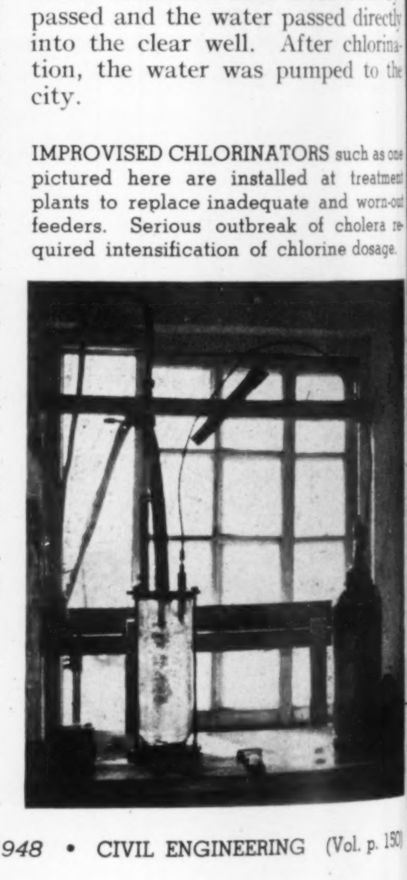
The project had been conceived and designed by Japanese engineers. A Japanese firm, the Ehara Kabushiki Kaisha of Tokyo, had held the contract for furnishing and installing piping, special valves, pumps and other machinery in the filter plant. The status of the project on V-J day was about as follows:

Item	Percent Completed
Impounding dam and reservoir	95
Pipelines	90
Pumping station	75
Service reservoir	50
Treatment plant (first unit)	50

It was realized that completion of the threatment plant would present the greatest obstacles because of the difficulty of obtaining such relatively complex items as hydraulic valves, rate controllers and similar equipment. It was thought at first that this equipment might be obtained from the United States or Japan. However the supply situation was very uncertain at the time and the need for quick action was imperative.

Consequently, the Japanese design for the rapid sand filters was revamped so as to eliminate all items of equipment that could not be manufactured locally. For example, remote-control hydraulic valves and rate controllers were replaced by standard hand-operated gate valves. Wash-water pumps were eliminated and replaced by a cast-iron pipeline feeding back by gravity from a clear-water service reservoir. Following an inspection of local foundries and manufacturing plants and conferences with the plant managers, it was decided that the required items, with the design changes just described, could actually be manufactured locally. Approval of the project by the authorities in Seoul was obtained and a grant of money was received.

In the meantime, the water shortage continued critical, causing great inconvenience and hardship to American troops as well as to civilians. Faced with the same situation, the Japanese had eased the shortage somewhat by making an improvised use of the uncompleted Suyong Project. A temporary pumping plant was set up near the river about a half mile below the dam. The suction line of the pump was placed in the center of an intake crib which extended to the river bottom. Then sand and gravel were placed around the 10-ft circular crib to form a filter blanket. Through a temporary connection the pump discharged into the concrete pipeline leading from the dam to the treatment plant. Here the sedimentation basin and filter beds were bypassed and the water passed directly into the clear well. After chlorination, the water was pumped to the city.



IMPROVISED CHLORINATORS such as one pictured here are installed at treatment plants to replace inadequate and worn-out feeders. Serious outbreak of cholera required intensification of chlorine dosage.

TABLE I. SUMMARY OF FACILITIES AT FOUR KOREAN TREATMENT PLANTS

Plants	Type of Filters	Plant Capacity: Cu M per Day	Plant Capacity: Mgd	Sedimentation Basin: Capacity Cu M	Sedimentation Basin: Detention Hr	Filtration Rate: M per Day	Filtration Rate: Mgd per Acre
Kowun Kyun (No. 1)	Slow sand	2,612	0.69	None	..	2.50	2.7
Sun Chi Kok (No. 2)	Slow sand	7,424	1.96	6,428	21	2.50	2.7
Bum U Sa (No. 3)	Slow sand	15,645	4.14	6,588	10	5.00	5.3
Pung Myun (No. 5)	Rapid sand	14,500	3.83	2,515	2*	120	128

* Based on ultimate plant capacity of 29,000 cu m per day.

It was considered that filtration rough the intake crib alone was infficient. To provide additional filation the river bed between the am and the intake crib was drained. hen water released at the dam owed underground to the intake, here it was picked up by the temorary pump. Chlorinated as bere, the water was shown to be of tisfactory sanitary quality by bacriological tests. To keep the river ed dry and to preserve riparian ghts, a diversion pipe was installed bypass water from the dam to a oint below the intake crib. The ater was controlled by means of a ate and released in sufficient mounts to satisfy the needs of users.

Construction contracts for completion of the Suyong River project (including the first unit of the treatment plant) were let during July 1946 to Korean contracting firms. The project was officially dedicated at ceremonies held in March 1947.

The distribution system of Pusan is characterized by small water mains and low pressures. Part of the explanation for the low pressures in certain areas is that water is available for only a few hours daily with the result that drafts are very high during a relatively short period of time. Small pipe sizes and improperly placed service reservoirs account for most of the inadequate pressures.

These deficiencies are dramatically brought home when water is needed to fight fires. Fire hydrants are located in manholes in the middle of the street. After opening the manhole, firemen must attach a riser pipe to the hydrant outlet, and couple the suction hose of the pumper to the riser pipe. Often residual pressures are so low that the demand placed upon the hydrant by the pumper cannot be satisfied. When this supply fails, a secondary system, consisting of a series of underground cisterns, is drawn upon. Unfortunately, these cisterns are spaced ather far apart so that long stretches of suction hose are required. Furthermore, the storage capacities are not sufficient to fight large fires.

Needs for the Future

Besides correction of the deficiencies in its distribution system, Pusan needs long-term planning, looking toward development of new sources of water supply. A similar situation exists in other large Korean cities.

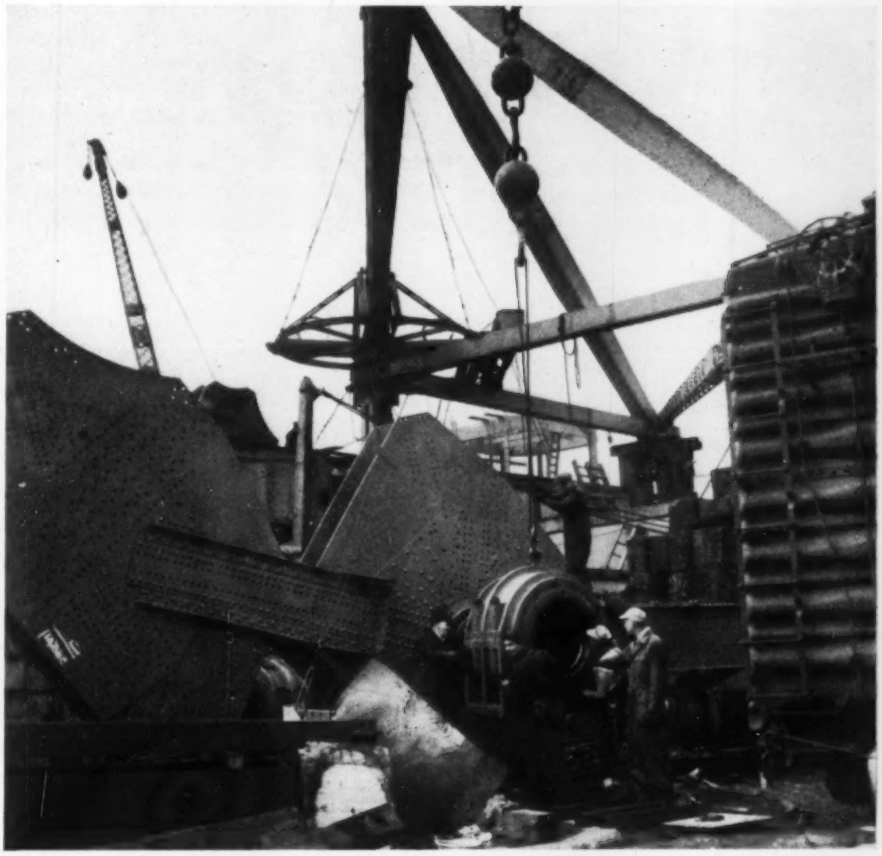
The output of the Pusan system at present is about 32,000 cu m per day. When the second unit of the Suyong Project treatment plant is completed, the output will be 46,500 cu m per day or only 30 gpd per capita, assuming a population of 400,000 and making no allowances for quantities supplied to industries, railroads and shipping, or for leakage losses. If the population of the city continues to grow at the present rapid rate and if the per capita and industrial demands increase at the same time, it is easy to see that the growth of the city as an industrial and shipping center will be seriously retarded by the inadequacy of its water supply.

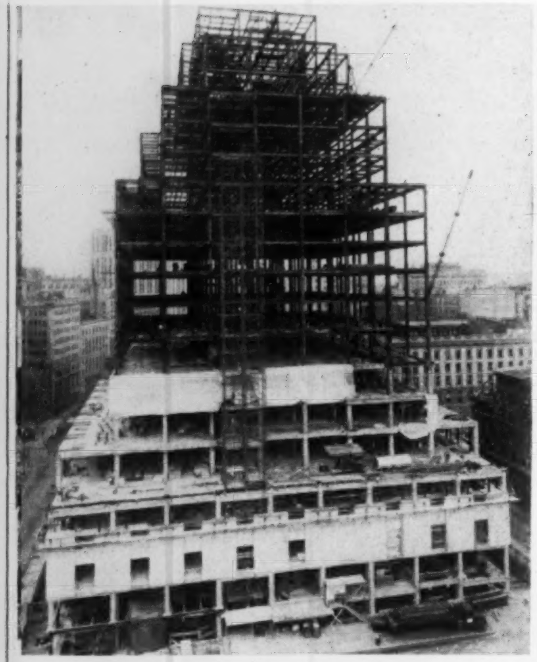
In keeping with the worldwide demand for higher living standards, Koreans will want improvements in sanitation. Water carriage systems for removal of human wastes will no doubt replace the laborious, unsanitary and certainly malodorous methods of feces removal now practiced. Such improvements will further increase the demands on municipal water systems.

The writer was stationed in Pusan from December 1945 to August 1946 and was assigned as sanitary engineer to the Military Government. Lt. Col. J. P. A. Kelly, CAC, and Maj. Jack A. Brown, AC, were, in succession, the military mayors of Pusan. Col. Melvin E. Gilette, Inf., was the military governor of Kyongsang Namdo Province, of which Pusan is the capital city.

Roller Bearings Support World's Largest Bascule Bridge

DESIGNED FOR ECONOMY in electrical equipment—and for low power, lubrication and maintenance costs—twelve anti-friction roller bearings are installed to seat trunnions of new North State Street Span over Chicago River, Chicago, Ill.—world's largest bascule bridge. Enabling two 75-hp motors to raise each 8,000,000-lb leaf without strain, these bearings—comparatively new in this type of structure—will preserve leaf balance during span lifts with minimum of starting and running torque. Leaves have two center truss bearings, 25 × 47 × 27 in., with $25^1/_2$-in. bore, each capable of sustaining 1,535,000 lb, and four outer truss bearings 25 × 43 × 27 in., each carrying load of 1,120,000 lb. Provisions for self-alignment permit vertical adjustment of each bearing to ensure true centering both during erection and later in case of change of alignment of bearing housings. Torrington Co., South Bend, Ind., is manufacturer of special bearings.





HUGE BACKLOG of essential building construction is result of virtual standstill in building activity since middle thirties. Pictured here is building of New England Telephone & Telegraph Co., Boston, Mass. Steel-frame structure, 18 stories high, occupies total area of 555,000 sq ft. *Contractor on all projects shown in this series of pictures is Turner Construction Co.*

A Look Into The Future of the Building Construction Industry

J. P. H. PERRY, M. ASCE

Vice-President, Turner Construction Co.,
New York, N.Y.

WHAT LIES OVER the immediate horizon for the building construction industry? How much of a backlog of deferred work has built up during the past few years of comparatively little activity? Can we expect some of the new materials we have been hearing about to be introduced and if so how will they affect the basic design, appearance and cost of our future buildings? Will new methods be introduced and if so how will they affect cost? These and many other questions of particular interest to engineers and contractors—discussed by Mr. Perry at the Construction Division luncheon during the ASCE Annual Meeting—are presented in the following article.

PREDICTING THE FUTURE of the building construction industry involves looking ahead in three ways to find the answers to the major questions of:

1. What's the job ahead of us?
2. What's available to do it with?
3. What methods can be used?

The job ahead is staggering in its immensity. Outside of industrial construction for war purposes from 1940 to 1945, and a considerable volume of industrial work since V-J Day, building construction in the United States in general has been at a standstill since the middle 30's. On Manhattan Island, for example, there have been but two office buildings worth mentioning built in the last ten years, namely, the Standard Oil office building at Rockefeller Center and the new Tishman Building at 57th Street and Park Avenue. The writer knows of no hotels or churches and but few hospitals that have been built in the last decade. Apparently the same has held true in Chicago and for a longer time.

A recent report of the McGraw-Hill Co. on its outlook for the construction industry for 1948 stated that contemplated building construction totals over $3\frac{1}{2}$ billion dollars, or more than eight years' backlog if each of the eight years is at the 1947 rate of accomplishment. Incidentally the total backlog recorded by McGraw-Hill for all construction is over 45 billion dollars. And as the *Engineering News-Record* points out, these backlogs are by no means all-inclusive. There are huge volumes of work contemplated but not publicly revealed as yet.

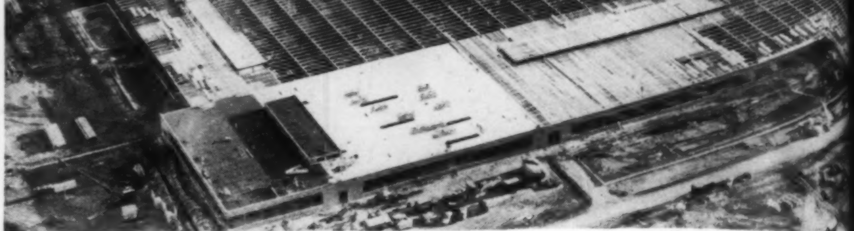
Next Decade Should See Increased Activity

There are influences currently working which should accelerate or enhance the building construction to be done in the next decade or so. Among them are:

1. The need for veterans' hospitals. The writer was astonished to hear authoritatively the other day that the peak occupancy load in the veterans' hospitals today is made up of veterans of World War I. These are men in their 50's with whom life has caught up and who claim aid of the Veterans Administration. It is not hard to think what the hospitalization problem for veterans will be when the age of World War II veterans reaches the same point.

2. The educational needs of the country for schools and colleges are well known. There is hardly a university or college that hasn't a large building program. These programs are far greater than they have been within the memory of man.

3. Universal military service or, failing that, a greatly enlarged permanent military organization in this country will require new facilities. The housing for the training of our armies for World War II was sub-



CONSTRUCTION TECHNIQUES present excellent opportunity for accelerated improvement in building field. Here, single-story structural steel manufacturing plant, covering area of approximately 700,000 sq ft, is constructed for Yale & Towne Manufacturing Co., Philadelphia, Pa.

sentially all temporary. Merely to replace the wooden barracks with permanent shelter is a huge task.

4. Private and government hospitals, other than for veterans, have to be built in great quantities. The 431 hospitals receiving benefits from the United Hospital Fund in New York practically all have expansion programs and the same is probably true right across the country.

5. .Greater than any of these specific elements tending to increase the load on the building industry is the accelerated birth rate. The following figures are taken from a reliable source:

Prewar births	about 2,200,000 a year
1947 births	3,730,000
Prewar marriages	1,400,000 a year
1947 marriages	1,900,000
1947	1,250,000 new families.

People are living better and expecting more room. While the divorce rate is high, 7 out of 8 divorced persons remarry.

People are living longer. In 1940 there were only 9,000,000 people aged 65 or over; there are now 10,600,000. The estimate for 1975 is 17,500,000 such people.

We have about 10,000,000 more people than had been expected. Population is now 145,000,000, a figure which it wasn't expected to reach until the early 50's. Fifty years hence there will be another 30,000,000 people or more.

If these vital statistics are correct, and they are pretty generally accepted, the problem of providing housing of all types—from hotels and apartments to low-cost housing and individual residences, plus hospitalization and the needs of the educational system—is hard to evaluate.

ERP Will Increase Building Construction

Another factor influencing this picture, and greatly so, is the apparent determination of this country to play big brother to all the world. If ERP is approved by Congress the effect on our national economy cannot but be great. The resulting exports will be tremendous and this should mean an expansion of our national productive machine which, as we have seen in both World Wars, means a great volume of building construction.

Overriding all these elements which tend to expand and accelerate the building needs of the country is the ever higher scale of living and the rapid working of obsolescence in this optimistically minded country. We like the "new look" in our buildings as well as in our women.

Some may say "Amen" to all this but with tongue in cheek, wondering whether high costs will cancel out these influences—or dreams as they might be called. Granted that costs are high, it is probably a fact that this country has had its biggest building booms in the face of the highest costs. Look at the great expansion in the 1920's. The building cost index from 1920 to 1929 averaged about 200 on a base of 100 for the year 1913, or about twice the prewar index. Today our cost index is 400 against a pre-World War II index of about 190, or a little over twice prewar. In the writer's experience of some 40 years it seems to be a fact that if there is need for buildings and the general business outlook is reasonably serene, high costs do not stop building.

MANY PRIVATE AND GOVERNMENT hospitals are urgently needed. Pictured here is new 14-story research building for Memorial Hospital—Sloan Kettering Institute, New York, N.Y.

It is only proper perhaps to temper this optimism as to the job ahead of the construction industry with a suggestion that some of the clouds now on the horizon tending to slow down the industry might develop into real storm warnings, which might make 1948 a relatively poor building construction year.

One of these clouds is the possible restriction of credit starting in the Federal Reserve System and working on through the banks. Interest rates are tightening. There is a shortage of working capital in many companies in the country. Loans for speculative buildings are harder to get. Should this movement grow, it would result in some unemployment and a minor reduction in prices. However, it might well be that this trend would be offset by the government's stepping in and releasing a lot of public works to offset any construction depression.

The other cloud on the horizon is the Russian picture. Should the present armed truce be terminated in an unfavorable way, private construction would probably freeze for a while.

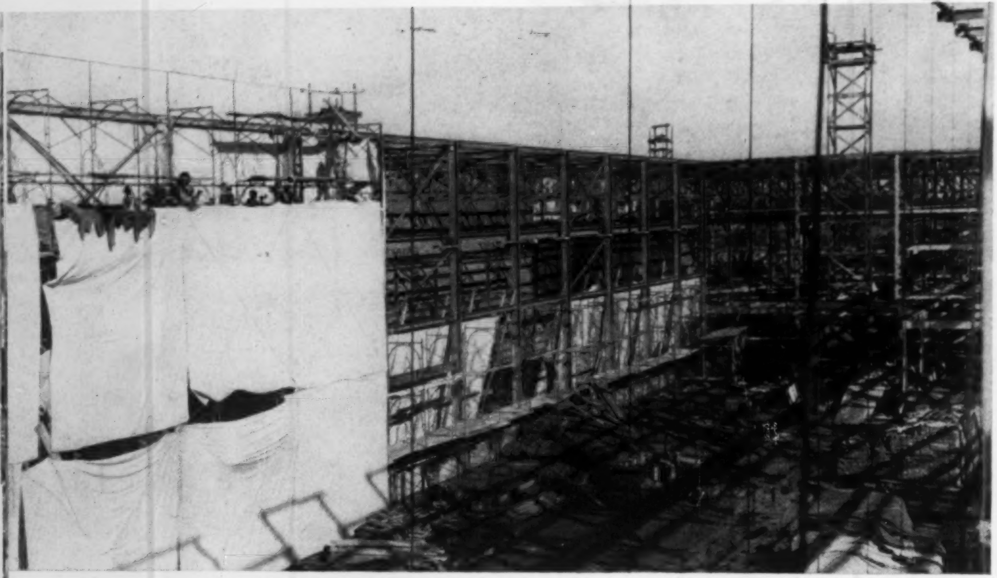
Personally the writer would not be averse to seeing some falling off of building construction this year. It should result in better efficiency of labor, a real stabilization of labor rates, and should give the manufacturers of building materials a chance to put deliveries on a more normal basis. It might tend to reduce the prices of some building materials, but steel and cement—both vital in any construction program—are not likely to be reduced in cost as there is a general demand for steel in every industry and in the road program, and the needs of the heavy construction industry will keep the cement bins dry for some time to come.

High Wages and Non-Productivity

In connection with this matter of costs it may be of interest to mention the writer's reaction to the very general opinion held by laymen that high wages and non-productivity of labor are solely responsible for the high cost of buildings today. The facts appear to be somewhat different. No small part of the higher costs today is for the satisfying of the owners' or tenants' demands for air-conditioning, acoustical treatments, improved intercommunicating systems, thermopane windows, universal floor ducts, aluminum or stainless steel sash, Houserman or Johns-Manville adjustable partitions, more fire-protective methods and a greater use of fine stone.

For the long pull there appear to be few if any influences that will tend to materially reduce building costs in this area in the next several years.

Getting back for a moment to the very general attack on the part of the layman on the construction industry, it is probably true that all engineers in construction have had the same experience as the writer, namely, that most of their friends have picked on the bricklayer for the number of bricks he doesn't lay and for the high hourly rate he is paid, seeming to



FALLING OFF OF CONSTRUCTION this year could result in greater labor efficiency, stabilization of labor rates and normalizing of building materials manufacturers' deliveries. Brickwork for plant of United States Gypsum Co., Clark Township, N.J., is shielded from weather by large canvas tarpaulins suspended from light metal scaffolding. Building has 341 × 563-ft over-all dimensions with 77 × 359-ft court.

imply that if the bricklayer situation could be corrected buildings would be cheaper. Unless these statements are interpreted as purely symptomatic and applying actually to all skilled trades and not merely to the bricklayer, it is fallacious to regard them as "signs of our times." The cost department of the Turner Construction Co. has released the following figures illustrating this point:

In an estimate totaling in excess of $20,000,000 for an office building in another city, $216,000 was recently allowed for brick masons and $73,000 for stone masons setting the limestone exterior. The combination of these two mason payrolls is only a little over 1¹/₂ percent of the entire cost of the building. On a $4,600,000 factory just finished in New Jersey, the total paid to bricklayers was $107,000 or a little over 2 percent of the total cost. On a 25-story hotel built in Manhattan some time ago, bricklayers were paid $95,000 or about 3 percent, and so it goes.

It would take a phenomenal reduction in bricklayers' wages and a similar increase in productivity to materially reduce the cost of a modern building.

As a matter of fact on another job it was found that, if all the on-site labor, from the first pick in the ground to the last bit of paint and putty, were eliminated, the cost of this finely finished building would be reduced by only about 16 percent. The high costs of buildings go right back to the mines and the forests.

Materials and Labor Available

We have looked at the job that is awaiting the building industry. We come now to the second of our "looks," namely, the materials and labor probably available.

Currently building materials a not too hard to get. If the demand is anything like as great as the foregoing would indicate, it appears that the amazing productive capacity of America as demonstrated in World War II will be able to satisfy all demands and not too tardily. Similarly with labor. While at the moment in certain areas there are shortages of skilled mechanics, it is certain that labor will flow to building work though perhaps at a price. American labor leaders are above all things not stupid and if there is money to be made men will be found to do the work.

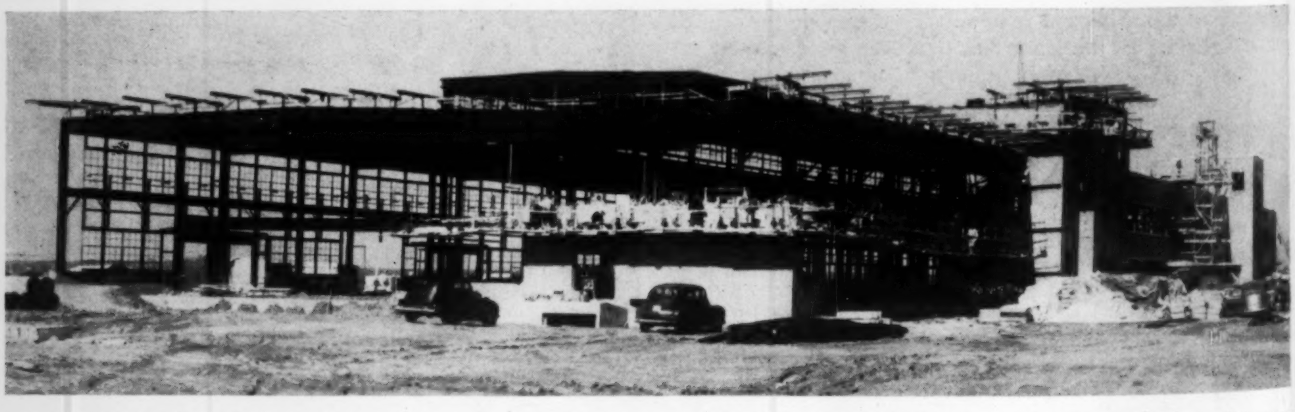
However, with a total labor force estimated at about 2,000,000 men in this country today, there ought to be more than 105,000 apprentices in training. It seems evident that with the efforts now being made in many directions, particularly through the leadership of the Associated General Contractors of America, there will be a real increase in the number of building apprentices in the next few years.

In the future the writer hopes to see stronger building trade unions, unions able to maintain discipline and to eliminate or strongly control jurisdictional disputes, the current real curse of the building industry. If the garment and printing trades have been able to produce ably managed, powerful unions, it would seem that the second greatest industry in the country, namely, construction, could in time follow suit.

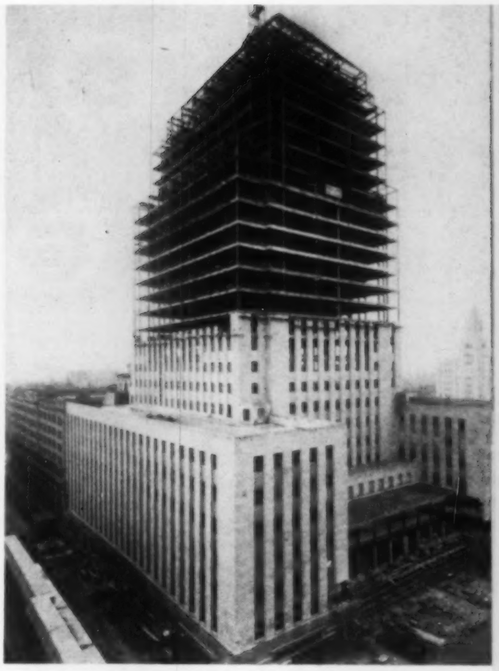
New Building Materials

It is more interesting, perhaps, to speculate on what may be new in the way of building materials. Are lightweight metals, enameled metals, high-tensile-strength glass, plastics and plywoods going to play a big part in the buildings of the future?

Are we going to be able to reduce the weight of our buildings so as to



EVER INCREASING need for research in various large industries emphasizes lack of research facilities. Two-story steel-frame laboratory and "semi-works" building of Johns-Manville Co., Manville, N.J., is first of large group of buildings to be devoted to research. Three others are now under way.



MORE THAN 50 PERCENT of 24,000 tons of structural steel required for 33-story addition to John Hancock Mutual Life Insurance Co., Boston, Mass., is below curb line. Highest office building in Boston, it covers total area of 1,040,000 sq ft.

approximate what has been accomplished in mobile powered units? An automobile engine in 1909 weighed about 15 lb per hp. Today it weighs less than 5 lb. Aircraft engines in 1909 weighed about 3.4 lb per hp and today the more advanced types weigh only a little over 0.5 lb per hp. The powerplant in a diesel railroad locomotive in 1918 weighed about 50 lb per hp and today weighs about 11 lb. Can the aluminum and magnesium manufacturers, given sufficient demand, produce structural shapes and floor panels at a price that will compete with structural steel?

One of the great changes that may be expected is the doing away with masonry walls, partly because of the opinion held by the public, and even by architects and engineers, about bricklayers. We will probably come to metal skin buildings. One is already contemplated on Park Avenue, New York, and the United Nations Headquarters, it is understood, have made elaborate studies of metal skins for their proposed buildings. The use of high-efficiency insulating materials, such as Vermiculite, as a backup for these skins, opens inviting vistas. High-tensile-strength glass, greater use of welding, plastics, phenol glues, all have a bearing on the building of the future.

New Architectural Trend Is Noted

A straw that is blowing about the country may be indicative of future buildings, not only as to materials but as to architectural treatment or esthetics. By this straw in the wind, is meant the gasoline filling stations spread across the country in the thousands. The great oil companies are not missing any bets. They are erecting buildings which attract and are pleasing to the motoring public—which is America. The use of color, functional architecture, metal skins and enameled metals is rampant. If time proves that the public continues to like these features, there may be a demand for them in homes and larger buildings.

Who can tell what effect atomic energy applied to industry may have on building problems? Personally the writer does not think it will be immediate or for a decade or two perhaps. Man is constitutionally and inherently loath to experiment with his home and history indicates that there is a substantial lag between invention and its adoption in buildings. It may be, of course, that this view is not valid and that the fellow on the radio the other night was closer to the facts. He was telling his wife that the atomic energy cooking stove would be 4-in. square. When she asked how in the name of goodness she could roast a turkey in a gadget like that he replied, "Why you put the stove inside the turkey of course." Such drastic changes may be in front of us—but probably not.

If it is recalled that there was a lapse of about 40 years between the invention of steel and the construction of the early skyscrapers in America, one of nearly 60 years between the discovery of aluminum and its first use for the exterior walls of a building, and one of nearly 40 years between the discovery of Bakelite and its present restricted use, there may be reason for this discounting of the imminence of the effect of atomic energy on the construction industry.

Methods Can Be Improved

The third projected look ahead has to do with methods to be used on future buildings. It appears that there is more chance for accelerated improvement here than in the use of new materials. The example of what was done in the shipyards, particularly on the West Coast, during the war, cannot be ignored. The greatly increased use of splendid mechanized equipment by their brothers, the heavy construction contractors, will not let builders' consciences rest easy. How much use may be made of television for management control of large jobs or radar in helping to solve foundation problems remains to be seen.

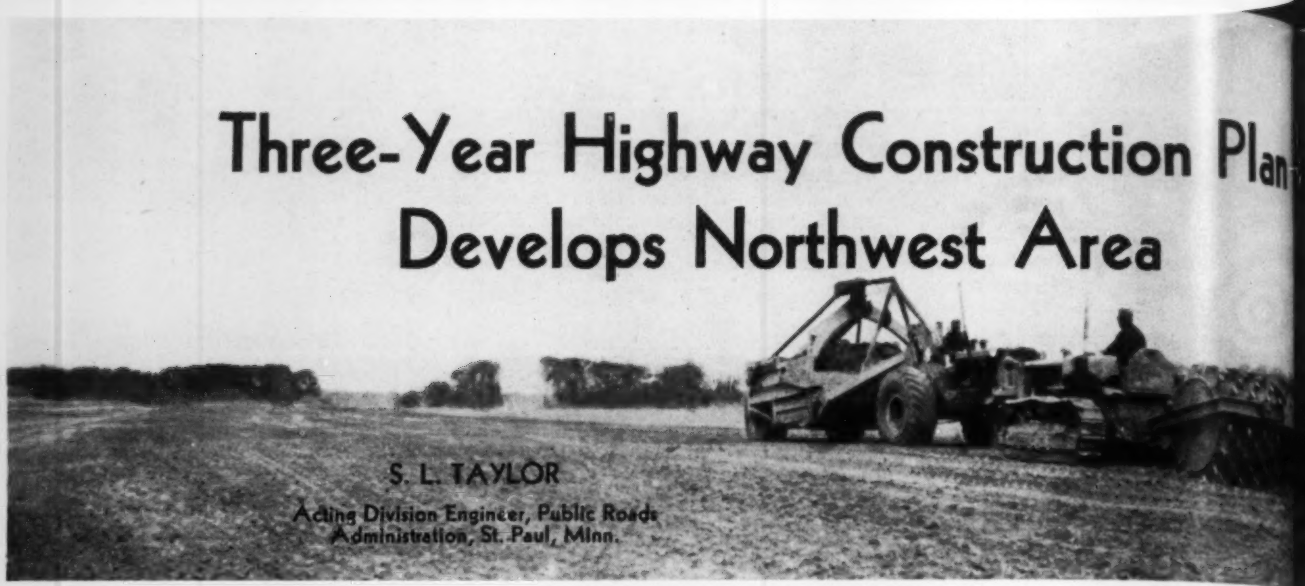
It should not be too difficult to persuade labor to permit increased mechanization of building erection and off-site assembly—in other words, prefabrication. The use of packaged units that can be set by powerful mobile hoisting equipment should reduce costs. Such units include bathrooms, kitchens, and power equipment in basements. This procedure has been used with refrigerating units; why not elsewhere? If the shipyards could do what they did in adopting pre-assembled units, there is no reason why this method cannot be employed in the building game to some extent at least.

As the years go by, building contractors will, the writer believes, tend to become more and more professional, perhaps more like the guilds of the 17th and 18th centuries. Contractors will become construction managers, working largely on a cost-plus basis through an increasing number of highly specialized subcontractors. It appears also that the engineer will become more dominant in the design of industrial buildings.

Probably the construction industry will have increasingly larger building units to construct. Radio City, the proposed United Nations headquarters, the Pentagon, the Metropolitan Life Insurance Company's housing projects, both in the Bronx and on the lower East Side of Manhattan, industrial plants such as Oak Ridge and Hanford—these are but indications of the future. There are many historical precedents. One has but to think of the Louvre, Versailles, the imperial palaces in Russia, the great European cathedrals, the Escorial near Madrid, to realize that as people get security and power they become monument builders. Builders now and in the future should never forget John Gunther's remark that "the United States is lousy with greatness."

Regardless of how big or complicated or difficult the buildings of the future may be, engineers serving their profession as contractors can take comfort in the remark of a noted contractor in the Middle West. As the story goes, this man listened to a discussion in Minneapolis one night among a distinguished group of intellectuals as to whether the Pyramids of Egypt had been designed by architects or engineers. After the discussion had gone on for some time his opinion was asked as to which he thought had done the job. He replied that he didn't know who designed the Pyramids but he'd like to bet that there was a damn good contractor in the picture.

Three-Year Highway Construction Plan Develops Northwest Area



S. L. TAYLOR

Acting Division Engineer, Public Roads Administration, St. Paul, Minn.

IMPROVEMENT ON NEW LOCATION for 14 miles of U.S. Highway No. 10, immediately west of Mandan, N.Dak., consists of construction of new grade having 42-ft roadway width. Here, grade is compacted by sheepsfoot roller drawn by D-4 tractor. Passing to right is loaded Tournapull.

THE 1944 HIGHWAY ACT, approved December 20, 1944, represents one of the milestones in the development of this country's highway transportation system. Former legislation permitted both rural and urban federal-aid improvements as well as secondary roads. Now, however, the legislation provides for integrating these types of improvements into a coordinated highway system which, as developed, will relieve traffic in the larger urban areas, provide better and more adequate rural federal-aid routes and give an all-weather surface for the secondary roads. A review of the provisions of the act and its effect on the area comprising Public Roads Administration's Division 5-N composed of Wisconsin, Minnesota and North and South Dakota—referred to herein as the Northwest Area—is presented in this article.

PROVISIONS of the 1944 Highway Act include a 40,000-mile national system of interstate highways, a federal-aid system to provide for interstate and intercity travel, and a federal-aid secondary system for main rural roads leading into population centers or to the federal-aid system. Aid is thus provided for the various classes of roads except for purely local land-service roads in rural areas and local city streets. The legislation further provides that the development of these three systems shall be carried out through the state highway departments. In the case of federal-aid secondary roads, the system selection is to be made by the states in cooperation with the appropriate local road officials and the Commissioner of Public Roads. Thus the state highway department becomes the coordinating agency in the development of an over-all highway transportation system in each state.

To start the development of these coordinated highway systems the act sets up funds for a three-year period. These funds consist of $125,000,000 each year for federal-aid highways in urban areas, that is, cities over 5,000 population, $225,000,000 for the federal-aid rural and urban system and $120,000,000 for the federal-aid secondary system, rural only. This is the first time that there has been a specific appropriation for urban work to aid in relieving congestion in the larger cities. Although no funds are specifically earmarked for the National System of Interstate Highways, this system is a part of the federal-aid system and can participate in funds made available for it.

These funds did not become available to the states until October 9, 1945, when the first postwar fiscal-year funds were apportioned for the year ending June 30, 1946. These funds are available for obligation for not to exceed one year after the year for which they are apportioned. There is, however, a bill now pending in Congress that will make the funds available for a maximum of two years after the year for which they were apportioned, and in effect will extend the present three-year program over a period of five years. The change seems desirable because of the difficulties encountered in carrying on this vast program. These difficulties will be discussed later.

In 1936 most of the states, in cooperation with the Public Roads Administration, established research projects known as Highway Planning Surveys in which many factual data on finances, traffic road costs and a physical inventory of the several systems were assembled. These tools were used in setting up the 1944 Act and were of invaluable aid in laying out the three systems and gaging the forms of improvement needed on the various types of roads. It was also of great aid to the states in discussions with various local groups.

During the war, in the Northwest Area as well as elsewhere, the roads deteriorated or became more obsolete as a result of the five-year suspension of replacement work. The states were fully aware of the added burden which this situation would place on them in added maintenance costs and expanded construction programs

PREPARATION OF NEW GRADE for 14-mile stretch of U.S. Highway No. 10 near Mandan, N.Dak., involves use of modern earthmoving equipment. In photo, 48-in. elevating grader drawn by D-8 tractor loads dump truck for quick removal of dirt from cut.

TRACTOR-DRAWN 9- AND 11-CU YD SCRAPERS secure loads of select material for top lift of grade from backslope cut adjacent to roadway. Federal-aid secondary project on state-aid road No. 1 north of Cokato, Minn., is graded and drained earth road. Ultimate surface will be gravel. Shoulder and fill slopes are 4:1 and 3:1; backslopes are 4:1. Design speed on 26-ft-wide roadway is 45 mph.

MOTOR GRADER SHAPES FILL slope with aid of cable to second motor grader on top of fill. Federal-aid secondary project between Redwood Falls and Morgan, Minn., consists of grading, draining and gravel stabilization. Ultimate surface will be mixed bituminous. Roadway width is 32 ft, shoulder and fill slopes are 3:1, and backslopes are 4:1 and 3:1. Design speed is 70 mph.

needed to catch up on the deteriorated and obsolete sections. Although the state highway departments operated with a skeleton engineering organization during the war, they were able to keep at least a limited force working on the preparation of plans for work to be undertaken after the war. The result was that a reasonable shelf of plans was available for improvements to the federal-aid system. However, much work remained to be done because the states in this area were entering two relatively new fields—urban street development and secondary road construction.

It was necessary for the state highway departments to work out federal-aid secondary systems with the appropriate county officials and submit them to the Public Roads Administration for consideration. The ease and speed with which this was accomplished depended to a large extent on the closeness of the contacts between the states and the counties prior to the enactment of the present federal-aid act. The present relationships have developed into a coordinated effort to make the secondary system complementary to the federal-aid system.

The mileages developed for federal-aid and secondary systems in the Northwest Area, as of April 30, 1947, are given in Table I. In addition to the mileages shown in the table, North Dakota has pending an addition to its system of 478 miles of state trunk highways and 1,400 miles of county roads.

Traffic maps, as well as other data collected by the Highway Planning Survey were of great value in determining the extent of the system and where it should be located to serve the greatest number of local people. As the state trunk highway systems in the various states are considerably larger than the permitted federal-aid systems, considerable state trunk highway mileage for lighter traffic is covered in the secondary system along with the county roads.

In three of the states a secondary road department has been set up to deal with the local units and handle the program. This arrangement has been very satisfactory and has focused attention directly on this feature. Especially in engineering, the secondary system differs from the primary routes since the secondary roads are being built to serve a wide variety of traffic volumes. Obviously a road carrying 25 to 50 vehicles a day warrants different engineering treatment from that required for an artery carrying 1,000 or more vehicles a day.

The development of at least a part of each system was the necessary first step in setting up a program of secondary road improvement. In only one state, however, were engineering services available in the counties to provide for the improvement of county roads. As a result either the state highway departments had to furnish the services or the counties had to enter into contracts with consulting engineering firms to provide the necessary surveys and plans. Because of these conditions, the secondary program has of necessity developed more slowly in most of the states than the federal-aid program.

Likewise the development of the urban program has not kept pace with the federal-aid program, as in the Northwest Area it required the development of a new relationship between the states and the cities. The purpose of the urban funds was to relieve the congestion on roads leading into the larger urban centers and not just to make minor improvements, or what are sometimes called routine housekeeping projects. The gridiron system of streets, developed in cities through the years, is a design wholly unsuited to modern traffic movement yet one which has received the sanction of custom. On this gridiron, city engineering forces have devoted most of their efforts to date, and major improvements cutting through the present system are necessarily exceedingly expensive and generally resisted on that account. Some bold planning is required if we are to open up entrances into the larger cities to permit greater freedom of movement together with

TABLE I. MILEAGES DEVELOPED FOR FEDERAL-AID AND SECONDARY SYSTEMS AS OF APRIL 30, 1947

		Federal-Aid Secondary System		
States	Federal-Aid System	State Highways	Local Highways	Total
N.Dak.	3,869	2,649	2,751	5,400
S.Dak.	4,275	1,647	8,625	10,272
Minn.	7,410	3,814	10,057	13,871
Wis.	5,512	4,438	8,631	13,069
Totals	21,066	12,548	30,064	42,612

CONCRETE FOR INTEGRAL CURB AND GUTTER (above, left) is hauled to job from central mix plant by transit-mix truck. In paving operations (above, right) Koehring 27-E paver is followed by Blaw-Knox gas-electric double-screed finishing machine. Cleft Plane Joint Installer is used in placing premolded bituminous filler strip along center line of joint. Operation is followed by Koehring longitudinal finishing machine for final surface finish.

PAVEMENT FOR TWO northbound 10-ft lanes (left) and integral curbs and gutters is shown in place. Second operation is placing of 20-ft slab for southbound lanes. Final stage is completion of parking lanes.

WISCONSIN FEDERAL-AID URBAN PROJECT in Racine includes new concrete pavement 56 ft wide and 9 in. thick with new integral concrete curb-and-gutter and 6-ft sidewalks. New section—from north end of main business section through outlying business and residential area—will accommodate four 10-ft lanes for moving traffic and two 8-ft parking lanes. Old rough brick pavement consisted of 50- and 20-ft sections separated by 10-ft raised parkway.

reduced travel time and greater safety. Much research was needed to discover what developments would give the greatest relief to traffic in these areas.

The states and the Public Roads Administration had for some time been anticipating the need for greater information about urban traffic. As a result traffic studies were conducted in some cities, both large and small. These studies varied from the extensive trip origin-destination type by home interview method, such as was conducted in Milwaukee, to a more limited type in which traffic was interviewed at a cordon of stations around the business area. It has also taken considerable time to get the idea accepted that certain revisions must be made in our cities if their tendency to "explode" beyond their boundaries to form ribbon developments along entering routes is to be retarded. The study of these conditions has resulted in a slower development of the urban program than of either of the other two. However, the writer believes that this has been a good thing in that the studies should result in better planning of the development of urban areas.

Table II shows the amount of federal-aid funds involved in projects which the states have programmed for construction and which have been approved by the Public Roads Administration. The table also shows the first year's allotment to each of the four states, which can be compared with the work now in approved programs. From this table it will be noted that all four states have substantial amounts of federal-aid funds programmed from the second year's allotment, and also that all four have at least one year's funds programmed for federal-aid secondary roads. However, in the case of urban funds, none of the states has more than one year of funds programmed.

When it comes to the next stage of development—approval of plans, specifications and estimates for various projects—we find that work on the federal-aid system has been progressing more rapidly than other types, and the least progress has been made on urban projects. The federal funds involved are listed, by states, in Table III. The next stage is that in which contracts have been awarded and work placed under construction. The record for projects in this category is good considering the difficulties encountered.

In carrying out this program the states have had to meet serious problems. The engineering personnel of state highway departments continues to be very limited owing to the shortage of qualified engineers and the competition of private industry which is able to pay much higher wages.

TABLE II. FEDERAL-AID FUNDS INVOLVED IN PROJECTS PROGRAMMED FOR CONSTRUCTION AND APPROVED BY PRA

	One-Year Apportionment			Total Amount Programmed to Jan. 1, '48		
States	FA*	FAS†	Urban‡	FA*	FAS†	Urban‡
Minn.	$6,055,101	$4,170,973	$2,206,152	$13,593,192.55	$10,465,856.29	$1,706,505.62
N.Dak.	3,347,724	2,412,044	214,578	6,475,796.58	3,578,203.38	208,218.00
S.Dak.	3,535,472	2,515,992	222,116	6,989,115.36	4,517,016.11	163,609.00
Wis.	5,434,891	3,681,127	2,654,468	6,893,383.00	6,611,371.35	2,605,987.00

* Federal-aid system. † Federal-aid secondary system. ‡ Federal-aid urban system.

TABLE III. FEDERAL-AID FUNDS INVOLVED IN PROJECTS FOR WHICH PLANS, SPECIFICATIONS AND ESTIMATES HAVE BEEN APPROVED BY PRA

States	FA	FAS	Urban
Minn.	$8,412,979	$4,989,773	$421,55
N.Dak.	1,740,125	145,551	.....
S.Dak.	2,563,465	460,901	3,331
Wis.	3,212,173	1,059,166	312,317

nless public work is made more ttractive, at least from the economic tandpoint, it appears that the main-nance of adequate engineering staffs ill continue to be a problem.

With the advance in contract costs, e states have been confronted with roblems other than engineering. he price index for 1940 was 71.6 and had risen by 1946 to 122.9. Al-hough the states and local units of overnment had accumulated some urplus funds during the war years, hey were faced with large mileages o be improved, a substantial increase in costs and an anticipated income increase that was not in proportion to the added needs and costs. This situation has necessitated the evision of programs and the omission of many necessary and desirable rojects. The Northwest Area, like he rest of the country, has suffered rom a lack of highway construction ontractors. In the United States as a whole 5,614 contractors were performing federal-aid highway construction during the period 1935–1946. From 1940 to 1946 there were only 3,057 contractors doing this work, leaving 2,557 contractors who had no federal-aid work during the latter period, or a mortality of about 45 percent. Despite the lack of definite figures for the Northwest Area, it appears that the same ratio would hold true there, although it has been observed that numerous firms have returned to highway work in the past year.

TABLE IV. POSTWAR FEDERAL-AID FUNDS INVOLVED IN TOTAL HIGHWAY WORK PLACED UNDER CONTRACT IN 1946 AND UP TO APRIL 30, 1947

STATES	FA	FAS	URBAN	TOTAL
Minn.	$ 6,472,799	$3,661,089	$421,555	$10,555,443
N. Dak.	780,257	110,902	....	891,159
S. Dak.	1,640,023	302,360	3,331	1,945,714
Wis.	1,837,523	505,316	39,817	2,382,656
Totals	$10,730,602	$4,579,667	$464,703	$15,774,972

Total work placed under contract in 1946 and up to April 30, 1947, in which federal funds participated, was:

Minnesota	$23,348,062
North Dakota	5,250,749
South Dakota	6,641,298
Wisconsin	12,261,216

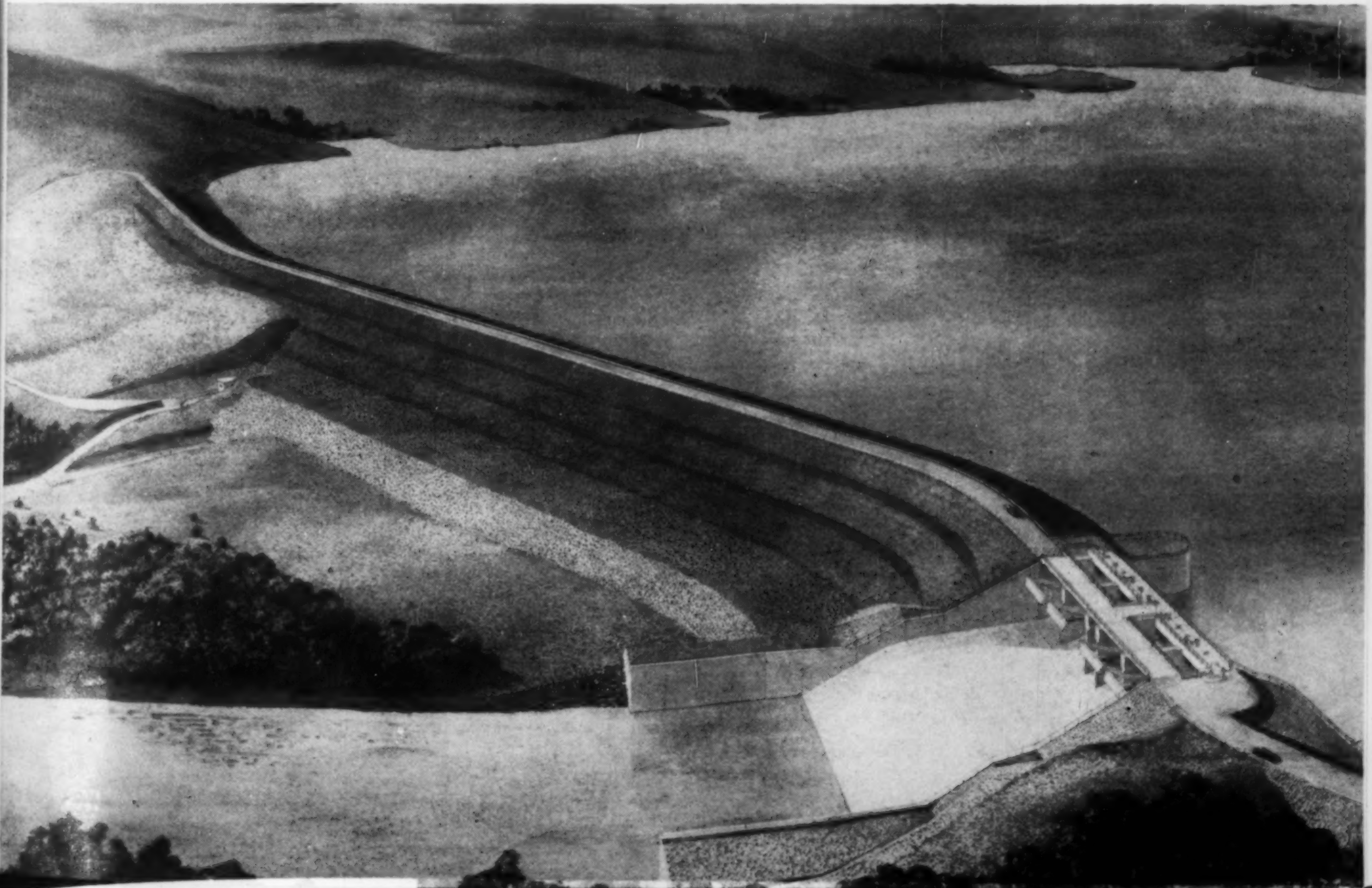
These contract awards involve approximately the amounts of postwar federal-aid funds shown in Table IV. the remainder of the contracts being financed by old federal-aid funds and the states' share. These sums might be considered to represent a favorable volume of work by prewar standards; however, they constitute not more than one-half of the first year's apportionment of federal funds under the 1944 Act.

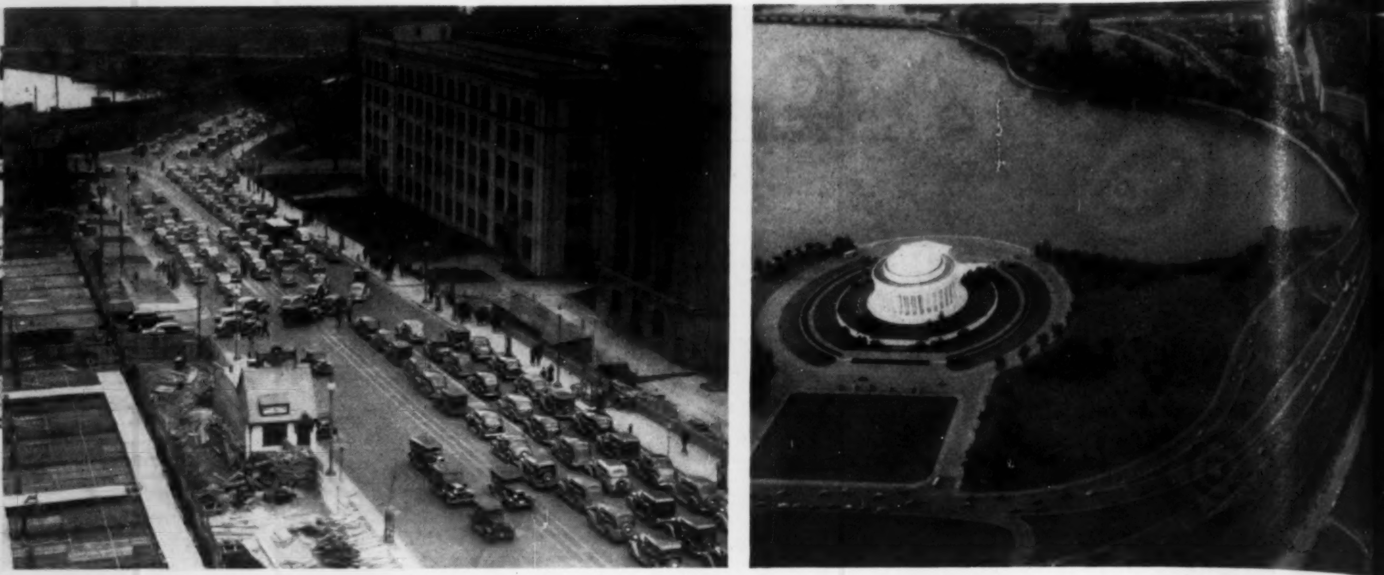
Work has been handicapped by scarcity of bridge materials of certain kinds, especially structural steel, and by the high price of structural work. While the price index on road work in general rose from 71.6 in. 1940 to 146.7 by the end of 1947, the index for structures rose from 87.6 to 205.6 during the same period.

(*Continued on page 84*)

Earthfill Dam Will Help Control Nebraska's Flash Floods

MEDICINE CREEK DAM to be constructed near Cambridge, Nebr., scene of devasting flash flood in June of last year, is 2,500,000-cu yd rolled earthfill structure, 102 ft high with crest length of 3,600 ft. Total excavation required is 3,500,000 cu yd. Included in construction is concrete spillway—with capacity of 139,000 cfs at maximum water surface elevation—at left abutment of dam, and 7.5-mile gravel-surfaced access road. Dam is part of Frenchman-Cambridge unit of Missouri Basin project which includes Enders Dam, now under construction on Frenchman Creek (CIVIL ENGINEERING, July 1947). When completed, combined storage provided by Medicine Creek and Enders Dams, will permit irrigation of approximately 53,000 acres of land in Republican Valley.





BOLD RECONSTRUCTION of roadway facilities in vicinity of 14th Street and Maine Ave. in Washington, D.C. (above) provides marked relief for highly congested intersection (above, left). Underground street-car terminal and grade separations with adequate interchanges accommodate normal traffic demand. (Courtesy Department of Motor Vehicles and Traffic, Washington, D.C.)

Traffic Improvements Through Traffic Engineering

WILBUR S. SMITH, Assoc. M. ASCE

Associate Director, Bureau of Highway Traffic, Yale University

BEFORE THE AUTO, the chief concern of highway engineers was with structural design. Then the auto came along and, with the development of functional demands on roads, immediately changed engineering concepts. The tempo of modern life is fast. People are hardened to its realities, and want the true facts. As a method of dealing with traffic problems the "shock treatment" is losing its effectiveness; the horrors of traffic casualties have been overemphasized; citizens tire of being told that the accident toll is alarming. The public wants to be safe but it does not want to be toyed with, delayed, and made to assume unaided all the obligations for traffic improvements. Traffic engineering provides important techniques for economically getting down to fundamentals.

WHEN ROADS ARE DESIGNED and constructed, the engineer's responsibility to the public has only begun. As a rule, a path for movement becomes a route forever! These roads, then, must be maintained and made to serve, as best they can, the persons and vehicles that use them, keeping in mind the fact that these uses constantly change and grow, necessitating new styles. Engineers universally assume responsibilities for constructing and maintaining roads, but the degree to which they engage in traffic operations varies widely.

Traffic engineering can play an important part in all three responsibilities and approximately 300 traffic engineers employed by public agencies throughout the country are now engaged in applying their professional skills to traffic improvement. Most of these men are civil engineers by training and experience, and many are active in the affairs of the American Society of Civil Engineers. The services of traffic engineers might be referred to as "what traffic men in civil engineering have to offer."

When the movements of motor vehicles first became congested and accidents became a problem, it was natural for the public and public officials to turn to the police for assistance. In most areas the enforcement agencies responded well, especially considering their multiplicity of duties, personnel limitations, and budget restrictions. They carry a substantial part of the load of traffic operations in every jurisdiction, and the whole load in many. While giving due credit to the work of enforcement groups, public officials and the public must recognize that many matters of constructing, maintaining, and operating highways depend upon engineering techniques for effectiveness. To these techniques the term "traffic engineering" has been commonly applied—too commonly in some areas, such as those where WPA flag wavers were titled "traffic engineers," as were sign painters, insurance claim adjusters, and others. Even though

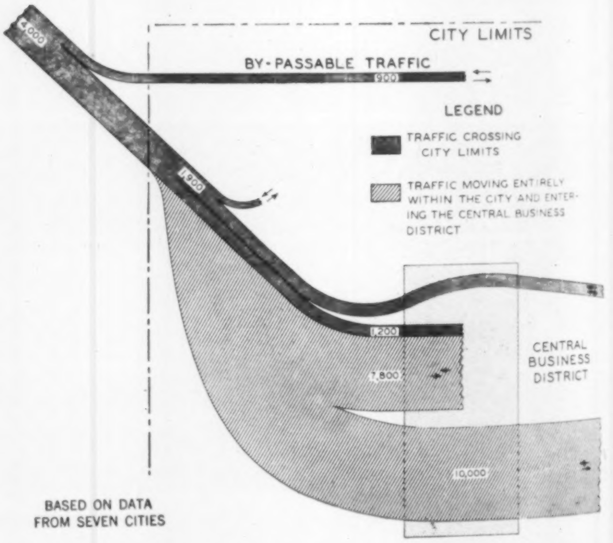


FIG. 1. RESULTS OF factual surveys break down old theories that most motorists want to bypass cities. Graph is based on survey of origins and destinations of traffic on an interstate route through typical city of 50,000 to 100,000 population. (Courtesy Public Roads Administration.)

APACITY OF SCOTT CIRCLE in Washgton, D.C. (right), is increased many mes by underpass for through traffic on 6th Street, one of city's main north-south teries. Other streets entering circle are hannelized so that signal control can be ffectively applied.

he title of traffic engineer was not mployed until about 1924, traffic ngineering functions had been perormed for many years—since long efore the advent of the automobile.

What Is Traffic Engineering?

Traffic engineering has been deined by the Institute of Traffic Engineers as "that phase of engineering which deals with the planning and geometric design of streets, highways, nd abutting lands, and with traffic operations thereon, as the use is related to the safe, convenient, and economic transportation of persons and goods."

Certainly such a broad definition precludes the assignment of a single title to all those doing traffic engineering work. On the other hand, there is no attempt or intent to "sweep in" many individuals and long-established activities and say that they should be considered only in traffic engineering terms. Neither is it intended that traffic engineering should usurp any other engineering functions. Any activity dealing with traffic must be broad in order to take into account the many factors in, and direct influences on, the traffic problem. When to the many types of roadways are added the highly variable characteristics of the automobile and the extremes of ability among drivers and pedestrians, considerable comprehension and latitude of activity are obviously required by traffic engineers and others in the traffic field.

Actually the titles assigned to persons and the designations applied to traffic functions are unimportant. Functions and techniques, rather than titles and terminology, are the things that count. "Traffic engineer" and "traffic engineering" are used here in a general sense. This is as it should be; if needed activities are performed, and if the job is well done, there should be little concern with the formality of nomenclature.

LOADING ZONES to accommodate riders of mass transportation facilities in Washington, D.C., are planned to minimize inconvenience to motorists. Proper marking of traffic lanes is essential to maximum utilization of intersection capacities. Intersection pictured is 14th Street and Pennsylvania Ave., looking south. (Courtesy U.S. Public Roads Administration.)

Admittedly titles are sometimes important in matters of public administration, in relations with the public, and in professional circles. On the other hand some fine jobs of traffic engineering are being done by city engineers, state highway engineers, and others with many different titles. These men recognize technical requirements and give matters of traffic operation their proper place in relation to design, construction, maintenance, and traffic service. In some cases, police officials have demonstrated aptitudes and capabilities for performing some traffic engineering functions well—often such officials have engineering training or experience.

Traffic engineering has advanced rapidly from an art to a science, even though it involves the highly variable human element which makes fixed values and treatments difficult. The application of engineering techniques to traffic makes traffic engineering the only strictly factual approach to traffic problems.

Many public officials and others do not realize that much is now known about traffic. Too often they feel like the police officials who admitted after more than 100 hours of traffic study that, "We didn't think when this course started that it was possible to find enough to talk about in traffic for more than 2 or 3 hours!" The amount of information available today on traffic engineering is re-

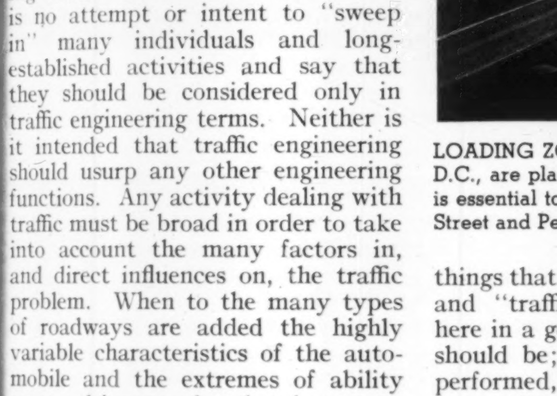


FIG. 2. NEW TRAFFIC survey techniques produce extremey accurate information regarding travel habits and motorists' desires. Most economical long-range planning is possible through development of street and highway system both as to locations and types on basis of such data. Graph gives comparison between traffic passing three control points as reproduced from interviews and that actually counted at those points.

INTERCHANGES CAPABLE of accommodating desires of motorists are carefully fitted to contours and land development, but retain high functional utility on Merritt Parkway in Connecticut. Direct-connection interchange is now favored over type pictured because it reduces travel distance and time, allowing motorist to make conventional left turn rather than two right turns to go left.

ELABORATE ENGINEERING STRUCTURES are necessary to provide reasonable speeds, proper access and traffic control at approaches to bridges and expressways in urban areas. Capacity and attractiveness of facilities are often regulated by approach designs. Pictured here is Croton Bridge over Thames River, Connecticut. (Courtesy Connecticut State Highway Department.)

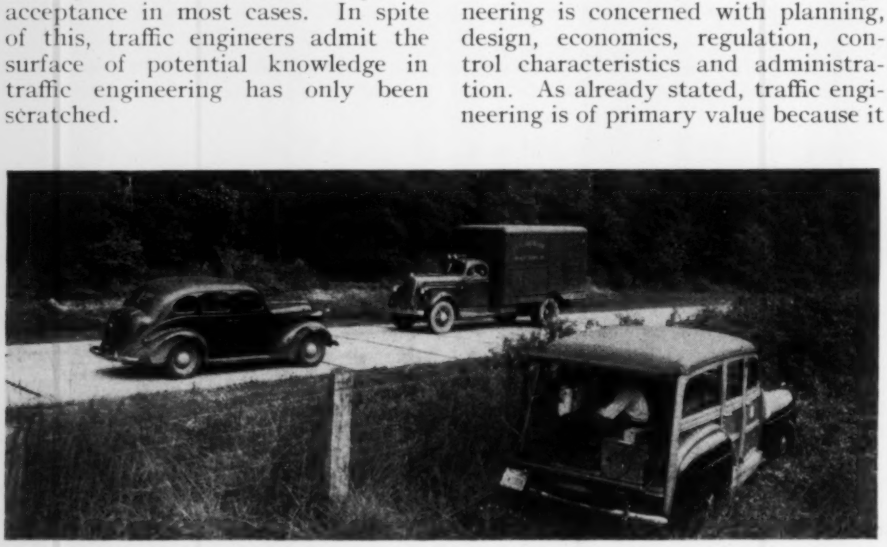
flected by the fact that a full academic year of graduate study does not allow adequate time to cover all factors. Traffic engineers have formed a reservoir of technical and practical knowledge on which to draw in solving traffic problems. This knowledge and technology have already exceeded official and public acceptance in most cases. In spite of this, traffic engineers admit the surface of potential knowledge in traffic engineering has only been scratched.

Before discussing at length the "why" and "how" of getting a traffic engineer, a few of the things which the traffic engineer can contribute to the community might be considered. All possible traffic engineering functions cannot be discussed here, not even all the most common functions, for traffic engineering is concerned with planning, design, economics, regulation, control characteristics and administration. As already stated, traffic engineering is of primary value because it makes opinions largely unnecessary. By so doing it provides aids which range from taking the "heat" off of politicians to the determination of basic characteristics about components of the traffic stream and intricate traffic designs.

Many interesting and valuable things have been learned about traffic. A few years ago routes were being constructed to bypass cities because it was believed such bypasses would solve downtown congestion problems. Studies now prove that most people approaching cities by auto want to go into them, not around them. Thus the value of traffic origin and destination surveys has been established. See Figs. 1 and 2.

Many ideas and plans have been advanced for the control of speed, but surveys show that with normal enforcement most motorists fix their individual speeds in accord with their own ideas of safety, based on their experiences with various conditions of traffic and roadway. Through speed zoning and other controls, speed regulation must become recognized by motorists as guides and driving aids, rather than as unnecessary restrictions.

Only now is considerable valuable information available about parking—basic desires, habits, etc. Much more needs to be learned. No one can answer, even with special traffic studies, all the valid questions that arise regarding the regulation of curb



TRAFFIC CHARACTERISTICS must be carefully ascertained to design and construct roadway facilities to meet modern traffic demands. Here measurements are taken of speeds and transverse placements of vehicles on two-lane roadway. (Courtesy PRA.)

CAMPBELL'S MARKET
KEEP RIGHT

LANDSCAPED MEDIAL STRIP provides safety for opposing traffic on six-lane highway in New Jersey. (Courtesy U.S. Public Roads Administration.)

arking, not to mention those in- olving the development of off-street arking facilities.

How should one answer an editorial riticism in the most powerful newsaper of a city to the effect that proosed changes from angle to parallel arking are undesirable because it is o easy to park and unpark at an angle, nd that "people only want to dash nto a store for a few minutes"? This is a very common problem, but ne that might be tough to solve in a given community because of all the misconceptions and selfish objectives surrounding it.

How can it properly be determined whether off-street parking should be provided underground, at the periphery of the business district, on this or that side of the railroad tracks, or elsewhere, without exhaustive traffic studies and analyses?

Intersection control is always a debatable matter. Many cities are spending thousands of dollars annually for the manual direction of traffic at intersections, when a more effective and efficient job could be accomplished with signals. Except for unusual conditions of roadways for traffic, manual traffic control either denotes inadequacies in signals or poor police administration.

One-way streets, properly arranged, make it possible to accomplish great improvements in city traffic conditions. Cases are known in which accidents have been cut in half and speeds increased, with the traffic volume doubled after changing from two-way to one-way movement.

State and local traffic codes must be kept modern. One state court recently held that motorists must keep to the right of the centerline through intersections on one-way streets. In speaking of court decisions, it should be pointed out that some courts have held that non-reflectorized regulatory signs have no legal authority at night. Such decisions pose problems for traffic agencies and are indicative of conditions that must be quickly corrected.

FUTURE TRAFFIC REQUIREMENTS are anticipated and provision is made in initial construction for stage development of original two-lane highways to four-lane divided roadways in California. (Courtesy U.S. Public Roads Administration.)

While simple, these few examples illustrate some of the values that can be realized from the services of traffic engineers. The traffic engineer should provide the technical answers to traffic problems through research, surveys and studies. Regulations must be modernized through research, surveys and studies. Regulations must be modernized without the influence of whims, politics, and personal ambitions; control devices should be made uniform and fitted to traffic needs; traffic facts must be collected and applied to the design and planning of new routes; and many cooperative activities must be pushed forward through traffic engineering techniques.

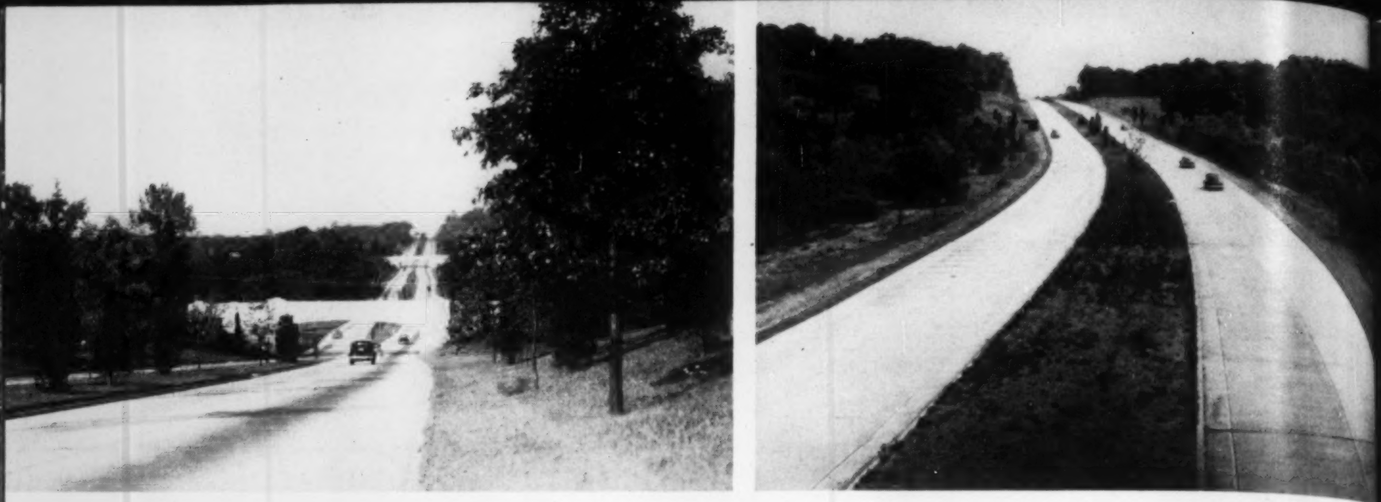
Public Must Be Properly Informed

Knowing what needs to be done is of little value unless the knowledge can be applied. Therefore it is necessary for traffic engineers to develop priority lists, trial installations, progressive treatments, "before" and "after" studies, and other means for getting cures accepted. Methods must be found for properly informing the public, since people are apt to see only the negative side of traffic engineering, as is so often the case with other engineering activities. Some people may think that traffic engineers have traffic counters working while they are at the office, asleep, or playing golf! Under no conditions should propaganda and ballyhoo be employed. Sell the public on the goods delivered and keep the publicity worthy of accomplishments. Through these means, traffic engineering can aid in the improvement of traffic conditions in all areas by using existing roadways to maximum efficiency and by seeing to it that traffic needs and desires are properly evaluated in the development of new facilities.

Like anyone else, the traffic engineer can develop an unbalanced program. For example, many have gone overboard in the conduct of traffic surveys. They literally survey everything—endlessly. From their work the public can rightly get the same idea as the man who said that the engineers in his city were always digging holes in the street—"digging one hole only to fill up another"! One big fault with traffic engineering is that too many surveys have been made that were never used. A survey just for the sake of a survey is a waste of effort and public funds. To yield the greatest value and economy all work must be done with a plan.

Traffic engineering no longer has to be sold to public officials. A recent survey by the Eno Foundation shows that 55 percent of the cities with populations of 50,000 and over have traffic engineers or give special attention to traffic engineering through their regular engineering staffs. All cities of 500,000 and over reported traffic engineers, and more

ORNAMENTAL BRIDGES and landscaping add to attractiveness of intersection interchanges. Landscaping is sometimes planned to facilitate control of traffic approaching and using interchanges. (Courtesy Missouri State Highway Department.)



DESIGN FEATURES OF MERRITT PARKWAY—reduction in medial-strip widths at grade separations and use of right-hand curb (above, left)—are not used on its extension, Wilbur Cross Parkway (above, right). To better fit traffic needs, medial strip on latter parkway is maintained at constant width and asphaltic shoulder replaces right-hand curb. (Courtesy Connecticut State Highway Department.)

than three-fourths of the cities with populations of 200,000 to 500,000 indicated the existence of traffic engineering divisions. About half the cities in the population group of 100,000 to 200,000 have traffic engineers but only one-third of the cities with populations of 50,000 to 100,000 have them.

It is significant that some city engineers and public works directors indicated that they had found the addition of traffic engineering activities to their duties especially valuable in developing public opinion, in getting support for budget requests, and in expanding their departments.

Seventy-eight percent of the states cooperating in the Eno study indicated that they had traffic engineering divisions or their equivalent. Other states distribute whatever traffic engineering functions are performed among various bureaus of the highway department or among other units of the state government.

Although many of the traffic engineering operations reported leave much to be desired, it is significant that the profession is now widely accepted. Many city, county, and state agencies are currently seeking the services of trained and experienced traffic engineers.

Place in State and City Governments

As a general rule, it is desirable to establish traffic engineering as a separate unit of the state highway department, or of the city government, so that there will be opportunity to work with equal effectiveness with all other departments and bureaus. However, many local conditions and circumstances have a direct bearing on the location of the traffic engineering department. These conditions are so variable that general conclusions are impossible.

Traffic administration, of which traffic engineering is only a part, deserves careful attention in every city and state. Effective work cannot be expected unless clear-cut organizations and policies are provided.

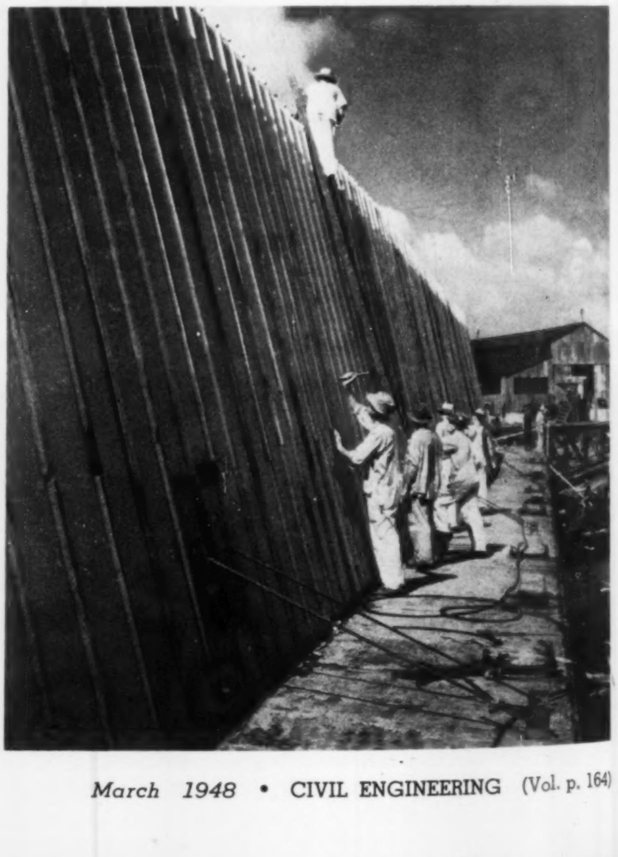
It might be well to point out that many effective traffic engineering aims have been accomplished in

(*Continued on page 88*)

Water Route Proves Economical for Shipping Large Annealing Furnaces

TRANSPORTATION BY BARGE down the Tennessee and Ohio Rivers and up the Mississippi from Fort Loudon, Tenn., to Davenport, Iowa, is proving to be an economical means of shipping eight all-welded, gas-tube-type annealing furnaces to the Aluminum Co. of America's new 43-acre sheet and plate rolling mill. Disassembling the 36×15×19-ft furnaces for shipment over land would have meant destroying the aluminum foil lining and complete rebuilding of the furnaces at their destination.

After a 5-mile haul by truck from Fort Loudon, the furnaces were loaded by crane onto 150-ft river barges, two to a barge, at the TVA Singleton Docks. The barges were towed down the Tennessee to the Ohio River and thence through 21 locks to Cairo, Ill., for the final leg of their trip up the Mississippi River to Davenport.



LARGE ANNEALING FURNACES are covered by heavy tarpaulin roofing paper and wood-reinforced canopy for 1,179-mile journey by barge from TVA Singleton Docks, Tenn., to Davenport, Iowa, via Tennessee, Ohio and Mississippi Rivers.

Particle Size of Dispersed Carbon Black Affects Entrainment of Air in Concrete

F. J. **MARDULIER**

Cement Division, Dewey and Almy Chemical Co., Cambridge, Mass.

FINELY DIVIDED dispersed carbon-black emulsions have been used for a good many years as an additive to color concrete and distinguish it from plain concrete, as in the case of center stripings, passing lanes, etc. The advent of air entrainment created a problem in the use of such finely divided carbon-black dispersions because of the early discovery that the normal percentages of entrained air were not obtained in carbon-black concrete upon the addition of normal percentages of air-entraining agent. For example, it was found that the percentage of air-entraining agent that would normally entrain 5 percent of air in regular concrete would only entrain 2 percent or less in concrete containing finely divided carbon-black dispersions.

In studying this tendency of carbon black to inhibit the formation of entrained air, it occurred to the company's chemists that the selective adsorption of the air-entraining agent by carbon black was largely dependent upon the particle size of the carbon black. In fact, subsequent tests showed that above a certain minimum size, such selective adsorption was decreased to the point where its effect was of no consequence. Hence new carbon-black dispersions have been prepared for use in concrete which give the desired black color without affecting air entrainment. Results of tests on such a carbon-black dispersion are given in Table I.

It will be noted that the carbon-black dispersion, labeled "B" in the table, did not increase the density of non-air-entraining concrete containing it. Furthermore, the addition of a normal percentage of Darex AEA, currently permitted by ASTM as an air-entraining agent, increased the air content $5^1/_2$ percent, as would have been expected in a plain concrete containing no carbon black. Workability of the carbon-black concrete containing the air-entraining agent was greatly increased with the result that a substantial reduction in the amount of water used was made possible. The reduced water content resulted in concrete compressive strengths considerably in excess of those obtained in plain concrete without carbon black, with or without any entrained air.

Current findings show that the new carbon-black dispersions, while giving a satisfactory color value, have no effect on the action of the air-entraining agents normally employed in concrete today.

TABLE I. EFFECT OF CARBON BLACK ON AIR ENTRAINMENT

Emulsified Carbon Black		AEA*	Unit Weight, Lb per Cu Ft	Percent Added Air	Slump, Inches	Compressive Strength, PSI		
Type	%	%				1-day	3-day	28-day
..	0	0.0	148.0	...	4.5	400	1,220	4,070
..	0	0.3	140.5	5.8	7.0	370	990	3,950
B	2	0.0	148.0	0.0	4.0	380	1,100	4,160
B	2	0.3	140.0	5.4	4.5	435	1,350	4,550

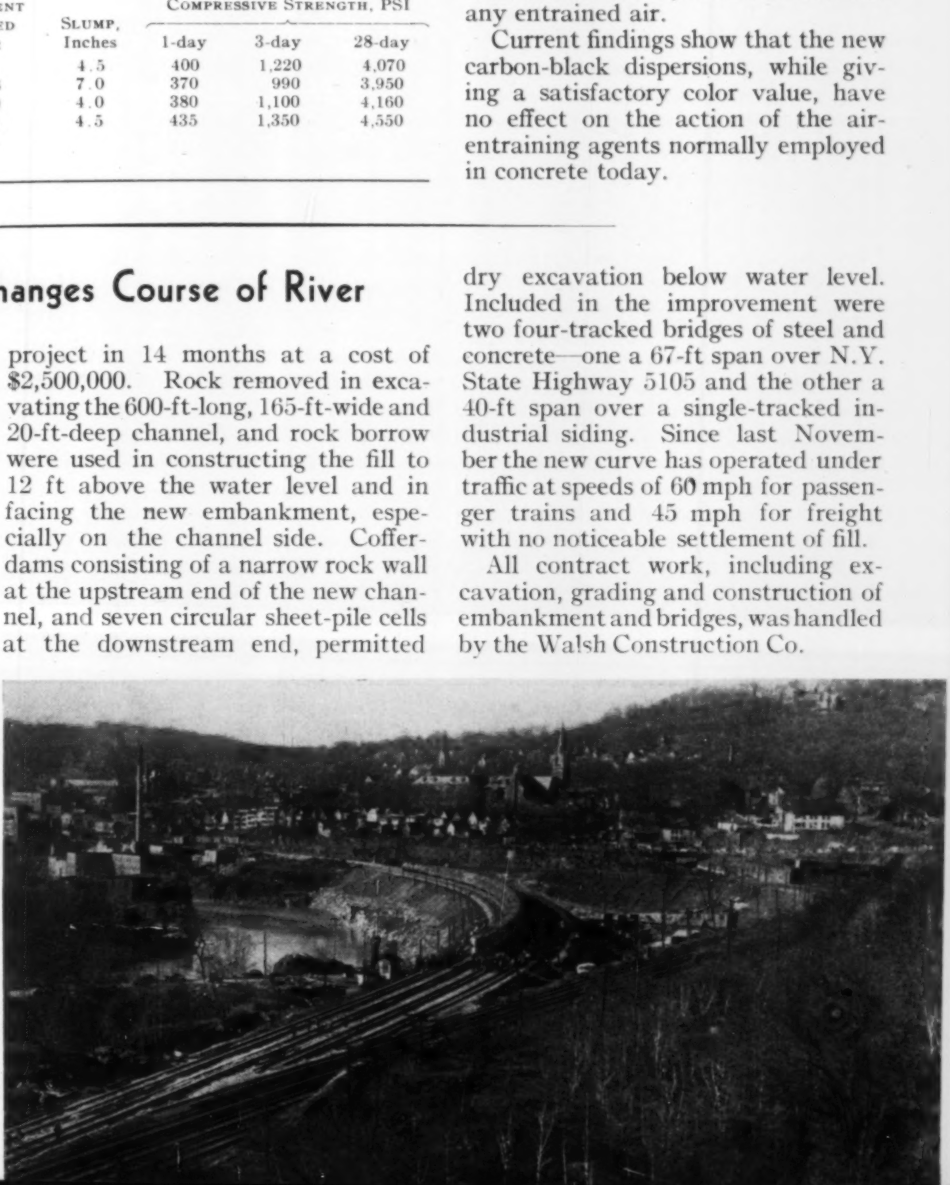
* Air-entraining agent.

Railroad Realignment Changes Course of River

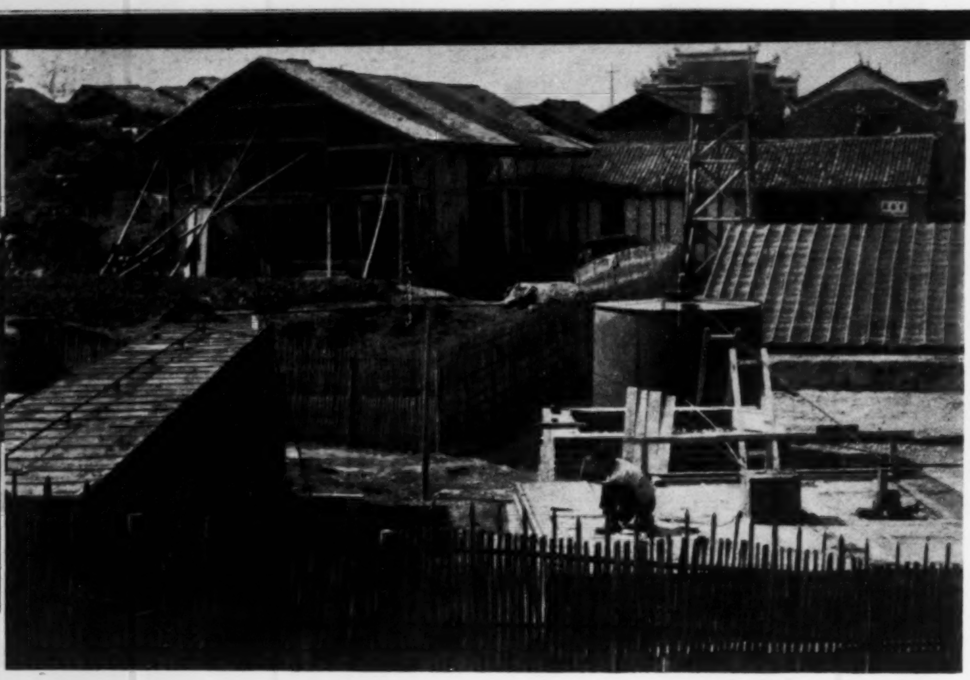
ELIMINATION OF a 7-deg 24-min curve on the main line of the New York Central System at Little Falls, N.Y.—one of the line's outstanding engineering projects in recent years—required the straightening of a sharp elbow in the Mohawk River and the construction of a 6,300-ft-long, 65-ft-high gravel-loam fill over the old river bed. The new 1-deg 30-min high-speed curve corrects the right-of-way at a point known as "Gulf Curve," site of the disastrous wreck of *The Lake Shore Limited* in April 1940.

Use of the most modern earth-moving equipment and engineering methods permitted completion of the project in 14 months at a cost of $2,500,000. Rock removed in excavating the 600-ft-long, 165-ft-wide and 20-ft-deep channel, and rock borrow were used in constructing the fill to 12 ft above the water level and in facing the new embankment, especially on the channel side. Cofferdams consisting of a narrow rock wall at the upstream end of the new channel, and seven circular sheet-pile cells at the downstream end, permitted dry excavation below water level. Included in the improvement were two four-tracked bridges of steel and concrete—one a 67-ft span over N.Y. State Highway 5105 and the other a 40-ft span over a single-tracked industrial siding. Since last November the new curve has operated under traffic at speeds of 60 mph for passenger trains and 45 mph for freight with no noticeable settlement of fill.

All contract work, including excavation, grading and construction of embankment and bridges, was handled by the Walsh Construction Co.



DANGEROUS CURVE on main line of New York Central System at Little Falls, N.Y., is replaced by high-speed curve on 6,300-ft-long, 65-ft-high rock-faced gravel and loam fill. Project, including blasting of new channel for Mohawk River—part of New York Central's postwar program involving commitments totaling about $200,000,000—was completed in 14 months at cost of $2,500,000.



TREATMENT PLANT built by UNRRA at Shaoyang, Hunan, turns human waste, garbage, and bonemeal into fertilizer by digestion. Process is performed anaerobically, by use of septic tanks, and aerobically, in manner similar to composting process used on farms.

SANITARY ENGINEERING IN CHINA is virtually unknown except in cities formerly under foreign control. An estimated $2,500,000 spent on sanitary supplies recently by the United Nations Relief and Rehabilitation Administration had little effect in solving the huge over-all problem of sanitary water supply and waste disposal for China's millions. The author, formerly a sanitary engineer with UNRRA's Agricultural Industries Service, describes an experimental project to which he was assigned—that of building an organic fertilizer plant at Shaoyang, Hunan, for converting human waste into sanitary organic fertilizer. The project demonstrates in a small way what China can do to reduce its sanitation problem and at the same time build a fertilizer industry.

Experimental Project Offers Solution to China's Sanitary Needs

RALPH STONE, Jun. ASCE

IN CHINA, a land torn by internal strife, most of the people are poor and illiterate. The community organization is weak, so it is difficult to construct and operate public water supplies, much less sewerage and garbage collection systems.

Even in the large modern cities such as Shanghai, Tientsin, Canton, Nanking and Peiping, the water systems do not supply running water to many of the homes. The excreta of most of the population are collected in buckets or carts and sold to the farmers for use as fertilizer. These excreta, called night soil, pollute drinking water and food so that it is small wonder that the filth diseases of typhoid, cholera, amoebic and bacillary dysentery, hookworm and other intestinal infections are prevalent.

When the UNRRA China Office was set up, a sanitary engineering program was included. Of the approximately 500 million American dollars budgeted for China, it is estimated that at least $2^{1}/_{2}$ million were spent for sanitation supplies. Foreign sanitary engineers were to be hired to utilize the UNRRA-contributed equipment in various regions of China and to assist the Chinese in developing a basic public health sanitation program.

The writer was assigned to work with UNRRA's Agricultural Industries Service in Shaoyang, Hunan. Hunan, one of the largest provinces in China, has a population of approximately 30,000,000 people. Because of its rich farm land it has often been called the rice bowl of China, yet unfortunately, because of economic and social dislocation, last year there was famine in this area.

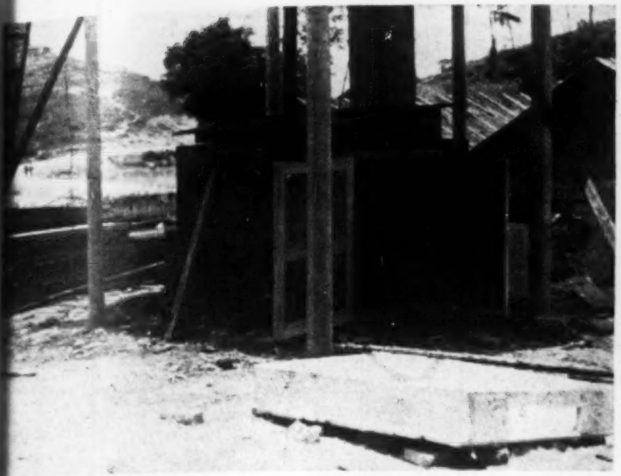
Demonstration Plant Set Up in Shaoyang

In all this vast province there is not one community with a public water supply. The Hunan Provincial Health Administration, utilizing UNRRA relief supplies, has tried to construct hospitals and carry out anti-epidemic work. But because of the lack of a stable economy and trained personnel, little progress in developing modern sanitation facilities has been made.

My principal job at Shaoyang, Hunan, was to construct a demonstration night-soil fertilizer plant. It was reasoned that if an economical method could be developed to convert raw night soil into a superior sanitary organic fertilizer, then the Chinese people could enjoy the benefits of proper waste disposal. Otherwise it might take many years before an artificial fertilizer industry could grow up in China and the night soil could be disposed of in a hygienic manner.

Shaoyang is a typical Chinese community of about 100,000 people. Its roads are narrow alleys partially covered with locally quarried limestone. The stores are covered with large Chinese banners and signs describing the merchants' products. Shayoang is famous for animal furs such as tiger, leopard and mink, which

DISTRIBUTION STATION at Shaoyang supplies towns-people's needs. Water, passed through sand filter and chlorinated, is pumped through piping along main street. Forty-thousand-gallon brick storage tank on hill above town provides head for distribution.



BLEACHING-POWDER PLANT provides chlorine for public toilets built by UNRRA and local administration in Shaoyang. Locally produced common salt, manganese oxide, and sulfuric acid are used in manufacture of chlorine gas, which is combined chemically with rich hydrated lime to produce bleaching powder.

CHEAP LABOR AND LOW COST of local construction materials permit construction of model public toilets, similar to one pictured here, for approximately $125 each. Made of local gray brick with tiled roofs, structures are screened with copper wire and finished with concrete.

are sold alongside of innumerable types of bamboo and other handiwork.

When the sanitation projects were outlined to the magistrate who governs the city, he agreed to cooperate fully. Thus a site was quickly obtained for the construction of the excreta fertilizer plant near the center of the city. This plant was built with local building material during the months of January through March 1947, while the townspeople gaped. More than once it was suggested that we were constructing an atomic bomb plant.

Actually the plant consisted of a number of tanks to digest the raw night soil together with garbage and bonemeal. This digestion was performed in two ways, anaerobically, that is, by the use of large septic digestion tanks much as in the United States, and aerobically, in a manner similar to the composting process used on farms. It was found that a satisfactory sanitary organic fertilizer could be made by these methods. The aerobic process in particular provided a high-class digested fertilizer product. Similar types of digestion plants constructed throughout China to provide sanitary fertilizer for the farmers would be helpful in controlling filth diseases.

The people of Shaoyang were greatly interested in the development of a community water supply. Since a quantity of UNRRA piping and pumping equipment was available it was decided to install a small water system. A simple sand filter was developed, and the chlorinated filtered water was pumped through piping laid along the main street. A 40,000-gal brick storage tank was built at the top of a hill in the center of the town to provide the necessary storage capacity and head for the distribution system.

The Chinese people carefully conserve their excreta because of the farmers' demand for it. However, the local public toilets and even the individual family latrines are extremely unsanitary. Flies, rats and odor abound. To ameliorate this condition, a program for the construction of model sanitary public toilets was undertaken. The magistrate's office contributed the land and the Agricultural Industries Service supplied the funds to build ten permanent sanitary public toilets and a semipermanent one. The ten toilets were built of local gray brick and had tiled roofs. They were screened with copper wire and had a concrete finish. Because of the low cost of local construction materials and labor, these toilets could be built for approximately $125 each.

Local Manufacture of Chlorine Gas

Since it was difficult to purchase chlorine in the form of bleaching powder, we decided to build a small bleaching-powder plant. In the neighborhood of Shaoyang common salt and manganese oxide are mined. These, together with locally produced sulfuric acid and lime, provided the chemical means for manufacturing chlorine gas and bleaching powder. The bleaching powder is produced by the chemical combination of chlorine with a rich hydrated lime. Undoubtedly for most Chinese cities it would be cheaper to produce chlorine by the electrolysis of common salt.

For community public health progress it is necessary not only to develop a satisfactory technical organization with a good sanitation program but also to educate the people in order to obtain their cooperation and support. Thus an important activity of an engineer in China is to train young Chinese engineers. At Shaoyang, Hunan, four inexperienced engineering college graduates were trained to carry on the sanitation activities. Also a special effort was made to educate the community on the value of water and night-soil treatment facilities. All the 8,000 school children in the 24 Shaoyang schools were required to make sanitation posters. Lectures and movies were given at the various schools and community organizations. Teams of older students were organized to go out into the countryside and teach the illiterate farmers the purposes of the fertilizer plant. Low-cost fertilizer was distributed to these farmers to obtain their goodwill and to encourage them to come to the night-soil treatment plant for their fertilizer.

These activities represent a typical Western approach to a sanitation program for China. However, it must be admitted that the operation of the sanitary facilities in Shaoyang is not a simple matter. Because of the lack of intelligent interest in public health sanitation, the lack of funds, and unsettled political conditions, the work that has been done probably will be allowed in part to deteriorate. Nevertheless, these activities were undertaken to demonstrate how the Chinese people could improve their environment and thus reduce the communicable filth diseases.

Engineers' Notebook

Method Simplifies Land-Leveling Operation

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LAND LEVELING is here discussed in its relation to irrigated farms where water conservation is highly essential to maximum beneficial use. Such leveling contemplates an adjustment of the ground surface by flattening or modifying its undulations to facilitate uniform application of irrigation water rather than by making a level plain. This method can also be adapted to airport and parking area design, to balance yardage where desirable.

IN GENERAL the productive capacity of unleveled irrigated lands is declining but proper leveling permits more efficient use of both land and water and increases the productive capacity of the land. Fields that are not properly leveled require excessive quantities of water to irrigate them. Much water is wasted through deep percolation in the low spots, and fertility of the soil is lost through leaching.

By trial methods the engineer who is called upon to design and supervise the grading of farm land can calculate the positions and slopes of the required planes. Since this method becomes tedious when the number of stations is large, a method has been worked out which develops the plane surface lying closest to the existing ground surface so as to produce a smooth grade with the least amount of dirt moving.

The example is based on a rectangular field. An irregular field can generally be worked out in the same way by simply taking the largest rectangle in the field and extending the grades on out beyond the edge of the rectangle. Experience will develop shortcuts that will save time.

All computations are on a station-interval basis. For stakes set 100 ft apart, this gives percentage directly, but for stakes at 50 ft, it gives a figure which is one-half the actual percentage grade, and so on.

Usually 10 to 25 percent is allowed for shrinkage and other dirt losses. The percentage varies somewhat with such factors as operators, kind of dirt, moisture content, and wind. Shrinkage loss runs up to 100 percent under severe conditions, but this is not usual. Where a field is loosely plowed, disked, or sandy, a greater allowance for shrinkage settlement all over the field is needed.

Where cuts and fills are made and the field is later plowed, there is a tendency for the surface to bulk up a bit, but there is not a corresponding swell on the fills, unless they are well compacted. This can usually be corrected by "floating" after the field is prepared.

Sometimes there will be insufficient shrinkage, or even more fill than cut. In that case, drop the elevation of the entire plane a few hundredths of a foot, or whatever is needed. Sometimes the best apparent plane is one that gives too flat or too steep a grade. This plane may be discarded and one substituted that is more suited to the conditions. Usually this is done in the direction of the runs, leaving the fall as it comes in order to minimize the amount of dirt. In changing the grade the field is always rotated on the centroid.

Obviously, the smaller the field the less dirt. Therefore, it is advantageous to cut up excessively large fields into smaller ones. Drawing contours will help in judging the size of the field by taking into consideration the desired length of runs. Sometimes a side slope is so steep that bench terraces are necessary. Compute these the same as for a regular field, except that a zero grade is used for the cross slope. Usually the benches are made 100 ft wide. This gives the equipment room to turn on the bench

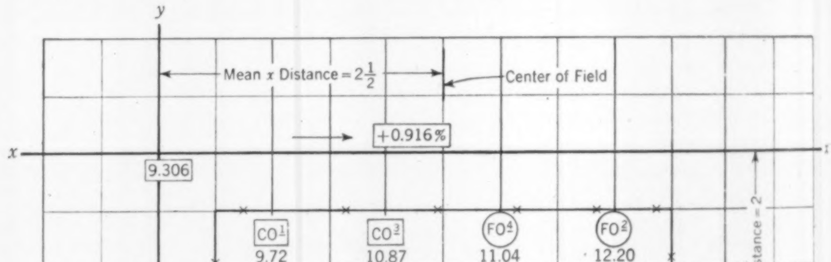

FIG. 1. GRAPH SHOWS hypothetical field as staked on ground. Vertical numbers = ground elevation; italic numbers = grade elevation; boxed figures = cuts; and circled figures = fills.

and makes it feasible to balance the bench within itself and cut down haul.

Heavy dirt-moving equipment is not suitable for finish work. Finishing can best be done with a land plane or by the farmer with floats, Eversman, etc. The leveled land should be planted in a crop for one season only, then disked and refinished again in the spring. Occasionally where cuts and fills are heavy and where extreme settlement occurs on the high fills, releveling of the same field may be necessary. There is a limit to the amount of shrinkage that can be put on a field, even where the fills are heavy, as a bump would soon build up so that water would not go over it. This means some additional work after the first settlement has taken place. Explain this to the farmer.

Cuts should be held to a maximum of about 0.8 ft. Cuts over 0.8 ft result in a spot of low production. However, this always picks up in a second year if the farmer will pay attention to the spot, add organic matter and nutrient elements.

Note that in the computations the coordinates may be put in any corner of the field. They are parallel to the lines of stakes. Usually the coordinates are placed so that the field falls in quadrant 4, i.e., the origin of the coordinates is northwest of the field. This plan works very conveniently, but any one of the field corners can be used. Always watch the algebraic sign. It shows whether the grade rises or falls from the origin of the coordinates.

While the computations are shown to hundredths, the cuts and fills are figured to the nearest tenth, splitting tenths to give a plane at the next lower figure rather than the next higher. Working approximately, of course, does not give a perfect balance but absolute accuracy is not necessary. Shrinkage is unavoidable and it is not practical for equipment to work to split tenths.

The constants are for unit width of fields. To get the constant multiply by the width of field in 100-ft stations.

Length of Field in Station	Constant	Length of Field in Station	Constant
2	0.5	20	665
3	2	21	770
4	5		
5	10	22	885.5
6	17.5	23	1,012
		24	1,150
7	28	25	1,300
8	42	26	1,462.5
9	60		
10	82.5	27	1,638
11	110	28	1,827
		29	2,030
12	143	30	2,247.5
13	182	31	2,480
14	227.5		
15	280	32	2,728
16	340	33	2,992
		34	3,272.5
17	408	35	3,570
18	484.5	36	3,885
19	570		

Example: If a field is 12 stations long and 8 stations wide, the constant would be 8 × 143 = 1,144.

These constants are the sum of the sums of a progression. The curve of the table is represented by the formula,

$$Y = 2.3684 \times 0.3267$$

where Y is the length of the field and X is the value of the constant in the table. This is for a unit width, and the

$$\text{Percentage grade} = \frac{M_t - N_a}{X \text{ width of field}}$$

This is more clumsy than using the table, and would involve more computations with attendant chance for more errors.

Method of Calculating Land Leveling

Example: To obtain grade in N-S direction:

1. Insert X-X and Y-Y coordinates. Note that origin is one interval west and one interval north and parallel to stake lines.
2. Total elevations in each line

9.72	9.09	8.24
10.87	9.85	9.79
11.04	10.45	10.27
12.20	12.52	10.74
43.83	41.91	39.04

Then total elevations are:

43.83
41.91
39.04

Total = 124.78 ΣH

3. Take moments about coordinates:

48.83 × 1 station from X-X = 43.83 × 1 = 43.83
41.91 × 2 stations from X-X = 41.91 × 2 = 83.82
39.04 × 3 stations from X-X = 39.04 × 3 = 117.12

Total moments = 244.77
= ΣM_y

4. Locate center of field in N-S direction; determine mean distance in Y-Y direction (Y_m) = 2 stations.

TABLE I. TABLE OF CONSTANTS FOR LAND LEVELING, WITH LENGTH OF FIELD GIVEN IN 100-FT STATIONS

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	0.5	2	5	10	17.5	28	42	60	82.5	110	143	182
2.	1.0	4	10	20	35	56	84	120	165	220	286	364
3.	1.5	6	15	30	52.5	84	126	180	247.5	330	429	546
4.	2.0	8	20	40	70.0	112	168	240	330	440	572	728
5.	2.5	10	25	50	87.5	140	210	300	412.5	550	715	910
6.	3	12	30	60	105	168	252	360	495	660	858	1,092
7.	3.5	14	35	70	122.5	196	294	420	577.5	770	1,001	1,274
8.	4	16	40	80	140	224	336	480	660	880	1,144	1,456
9.	4.5	18	45	90	157.5	252	378	540	742.5	990	1,287	1,638
10.	5	20	50	100	175	280	420	600	825	1,100	1,430	1,820

	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
1.	227.5	280	340	408	484.5	570	665	770	885.5	1,012	1,150	1,300
2.	455	560	680	816	969	1,140	1,330	1,540	1,771	2,024	2,300	2,600
3.	682.5	840	1.020	1,224	1,453.5	1,710	1,995	2,310	2,656.5	3,036	3,450	3,900
4.	910	1,120	1,360	1,632	1,938	2,280	2,660	3,080	3,542	4,048	4,600	5,200
5.	1,137.5	1,400	1,700	2,040	2,422.5	2,850	3,325	3,850	4,427.5	5,060	5,750	6,500
6.	1,365	1,680	2,040	2,448	2,907	3,420	3,990	4,620	5,313	6,072	6,900	7,800
7	1,592.5	1,960	2,380	2,856	3,391.5	3,990	4,655	5,390	6,198.5	7,084	8,050	9,100
8.	1,820	2,240	2,720	3,264	3,876	4,560	5,320	6,160	7,084	8,096	9,200	10,400
9.	2,047.5	2,520	3,060	3,672	4,360.5	5,130	5,985	6,930	7,969.5	9,108	10,350	11,700
10.	2,275	2,800	3,400	4,080	4,845	5,700	6,650	7,700	8,555	10,120	11,500	13,000

	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
1.	1,462.5	1,638	1,827	2,030	2,247.5	2,480	2,728	2,992	3,272.5	3,570	3,885
2.	2,925	3,276	3,654	4,060	4,495	4,960	5,456	5,984	6,545	7,140	7,770
3.	4,387.5	4,914	5,481	6,090	6,742.5	7,440	8,184	8,976	9,817.5	10,710	11,655
4.	5,850	6,552	7,308	8,120	8,990	9,920	10,912	11,968	13,090	14,280	15,540
5.	7,312.5	8,190	9,135	10,150	11,237.5	12,400	13,640	14,960	16,362.5	17,850	19,425
6.	8,775	9,828	10,962	12,180	13,485	14,880	16,368	17,952	19,635	21,420	23,310
7.	10,237.5	11,466	12,789	14,210	15,732.5	17,360	19,096	20,944	22,907.5	24,990	27,195
8.	11,700	13,104	14,616	16,240	17,980	19,840	21,824	23,936	26,180	28,560	31,080
9.	13,162.5	14,742	16,443	18,270	20,227.5	22,320	24,552	26,928	29,452.5	32,130	34,965
10.	14,625	16,380	18,270	20,300	22,475	24,800	27,280	29,920	32,725	35,700	38,850

5. T means moment $= Y_m \times \Sigma H = 2 \times 124.78 = 249.56 = M_y$.

6. Note that field is 3 stations long in direction in which you are working and 4 stations wide. Look up constant in Table I, which in this case is $8 = C_y$.

7. Supply formula:

$$Y\% = \frac{\Sigma M_y = M_y}{C_y}$$

$$= \frac{244.77 - 249.56}{8}$$

$$= -\frac{4.79}{8} = -0.599\%$$

8. Notice that minus sign!

9. This is the grade of a plane which lies closest to the ground in the direction worked.

10. Obtain E-W grade same way, i.e.:

	Elevations	Moments
Total of 1st col.	= 27.05 × 1	= 27.05
Total of 2d col.	= 30.5 × 2	= 61.02
Total of 3d col.	= 31.76 × 3	= 95.28
Total of 4th col.	= 35.46 × 4	= 141.84
	124.78 = ΣH	325.19 = ΣM_x

Note that ΣH equals value found for other set of figures showing work is correct to that point.

Note: $X_m = 2^1/_2$

C_x for field 4 stations long × 3 stations wide = 15

$$M_x = 124.78 \times 2^1/_2 = 311.45$$

$$X\% = \frac{325.19 - 311.45}{15} = \frac{13.74}{15}$$

$$= +0.916\%$$

11. Compute elevation of origin of coordinates; N = number of stations $= 3 \times 4 = 12$

$\frac{\Sigma H}{N}$ is the centroid elevation

$$H = \frac{\Sigma H}{N} - (X\% \times X_m) - (Y\% \times Y_m)$$

$$= \frac{124.78}{12} - (+0.916 \times 2^1/_2) - (-0.599 \times 2$$

$$= 10.398 - 2.29 + 1.198$$

= 9.306 origin of coordinates

12. Apply grades given to the H, to obtain elevations of the plane; show plotted in black. Cuts and fills are then taken direct.

13. Total cuts and fills separately.

Total cuts	= 1.8 ft
Total fills	= 1.7 ft
1.0 ft	= 370 cu yd
Total cuts	= 666 cu yd
Total fills	= 629 cu yd
Difference	= 37 cu yd = 6% for shrinkage

For accurate yardage use average end area of calculating yardage. To help the machine operator in the field, when marking stakes mark the cuts in red and the fills in blue and color the field sheet accordingly.

Tests Determine Discharge Coefficients for Small Siphons

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SMALL SIPHONS of metal or plastic material have been found more economical than sluice boxes in conveying water from laterals to furrows to irrigate row crops. The results of a series of tests made to determine the coefficient of discharge in such siphons with open and submerged outlets are presented herein.

In Fig. 1 is shown a siphon with its upper end immersed in the water of a small irrigation ditch. If the siphon is completely filled with water, flow takes place when its lower end is opened. Discharge may then be determined by use of the following equation:

$Q = CA\sqrt{2gH}$, in which

Q = rate of flow in cfs

A = area of siphon opening in sq ft

H = head in ft (heads in excess of 34 ft do not cause additional flow.)

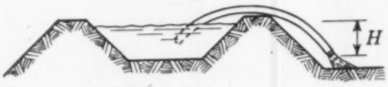

FIG. 1. SIPHON with upper end immersed in small irrigation ditch conveys water economically from lateral to furrow for irrigation of row crops.

C = coefficient of discharge determined by tests

g = acceleration due to gravity

The coefficient of discharge is influenced by the diameter and length of the siphon and by the depth of submergence of its discharge end. To determine coefficients of discharge for four small siphons, all 48 in. long, a series of tests were run under two main conditions, as follows:

Case 1. Siphon discharged into the air as in Fig. 1. In this case H is the vertical distance between the water surface and the discharge end of the siphon.

Case 2. Discharge end of siphon was submerged about 2 in. In this case H is vertical distance between upper and lower water surfaces.

In both cases it was found that for proper operation, the upper ends of the siphons should be immersed by at least 2 in. Dimensions of siphons and the discharge coefficients determined are given in Table I. The discharges of the siphons, in gallons per minute, based on the coefficients determined for Case 1, are given in Table II. If the discharge end of the siphon is submerged, the values in Table II should be reduced by 6 to 10 percent.

Since the plastic siphons were not consistently circular in section, their inside diameters could not be accurately determined. Clear water at a temperature of 75 deg F was used in the tests. The use of muddy water would probably have decreased the discharge. In Case 1 the siphons could be operated at low heads although it was hard to start them at these heads. In Case 2 the siphons were easily started and operated at low heads.

TABLE I. DIMENSIONS OF SIPHONS, IN INCHES, AND DISCHARGE COEFFICIENTS DETERMINED FOR CASES 1 AND 2

Diameter of Siphon	Radius of Curvature	Coefficient of Discharge	
		Case 1	Case 2
$^7/_8$	24	0.617	0.57
$1^1/_8$	22	0.62	0.58
$1^5/_{16}$	28	0.66	0.62
$1^7/_8$	24	0.70	0.63

TABLE II. DISCHARGES OF SIPHONS, IN GPM, AT VARIOUS HEADS, BASED ON COEFFICIENTS FOR CASE 1

Head, In.	Diameter of Siphon, In.			
	$^7/_8$	$1^1/_8$	$1^5/_{16}$	$1^7/_8$
3	4.6	7.7	11.2	24.2
4	5.4	8.9	12.9	27.9
5	6.0	10.0	14.5	31.4
6	6.6	10.9	15.8	34.2
7	7.1	11.8	17.1	37.0
8	7.6	12.6	18.2	39.4
9	8.0	13.4	19.3	41.8
10	8.5	14.1	20.4	44.2
11	8.9	14.8	21.4	46.4
12	9.3	15.5	22.4	48.4

... THE READERS *Write*

Cites Needs for Further Research in Algal Control

To the Editor: Experiences associated with the copper sulfate treatment of Round Pond, a natural body of water in western Connecticut and source of water supply for Ridgefield, pose questions that may interest engineers who have similar water supply problems.

During the 25-year period, 1906 to 1931, a copper sulfate dosage varying from 125 to 130 lb per treatment was usually made once a season at Round Pond. In September 1932 a dosage of 233 lb was made. By February 1933 the water in the distribution system was so highly colored that the State Board of Health recommended a copper sulfate treatment of 2 lb per million gallons in the belief that plankton growth in the pond was the cause of the trouble. Accordingly a 900-lb dosage of copper sulfate was made in March 1933. Immediately after that treatment dead fish were found and removed. By August of the same year an underwater growth, *Clathrocystis*, was noted on underwater rocks along the shore line. Despite the introduction of increasing dosages of copper sulfate—as much as 2,775 lb in five doses in 1934 and 2,700 lb in four doses in 1938—the discoloration became progressively worse until by 1940 it reached a point where visibility decreased from around 20 ft to about that number of inches.

To replenish the fish supply, 1,000 large-mouth bass were put in the pond in June 1940, with the unexpected result that by September the water had begun to clear. In October 4,000 barred killifish were added, and by May 1941 the discoloration had dropped to 12 ppm from the 15 ppm reported in May 1940. In November 1944, 3,000 golden shiners, 5,000 killifish, and 500 adult sunfish were added, and a month later 300 yellow perch.

At the present time the water is clear to a depth of more than 20 ft, and there have been no algal troubles, despite the fact that there have been no copper sulfate treatments since April 1939. There has been no change in the watershed in any respect for many years.

A limited investigation of the situation was made from late in 1944 into 1946 by Herbert E. Warfel, a trained limnologist from the Bingham Oceanographic Laboratory at Yale University. It is his suggestion that water from the fish hatchery, added to the pond when the bass and killifish were planted, contained organisms, e.g., plankton such as crustacea, that did the job of clearing up the pond. In other words, plankton, not the fish, restored the pond to the satisfactory visual condition which existed in and before 1931. Unfortunately no observations were made by which this hypothesis can be proved or disproved. Chemists and other limnologists have expressed varying opinions, no two of which agree and not one of which offers a more plausible explanation to account for what has taken place.

As a result of the experience at Round Pond, more thorough limnological, chemical and geological studies are contemplated to determine, if possible, the following: (1) What indications are there of the possibility of algal trouble; (2) what steps, if any, can be taken to forestall and prevent algal trouble, especially steps that do not involve the use of chemicals and, specifically, copper sulfate; and (3) if chemicals must be used, what follow-up treatment shall be used to restore a "balance of nature" in the pond.

The situation poses another interesting question: What effect do chemicals and water compositions have on the human system? Even if the chemicals themselves do not have a direct effect, they might have an indirect effect by destroying plankton or making changes in composition. To the best of my knowledge, this is still an unexplored field, and it may well be that such effects can be determined only after a long period of observation, from tests yet to be originated.

These questions are raised in the hope that engineers will be induced to think and act along lines that will achieve far-reaching results in the water-supply field. What happier solution for a water superintendent could there be than to know that by sending for a few 40-gal cans of water from a fish hatchery his troubles would be lessened, or even over?

Francis W. Collins, Assoc. M. ASCE
Ridgefield, Conn.

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Notes Economies Effected on Santee-Cooper Project

Dear Sir: The article by Henry Jewell, in the January issue, on the porous concrete slope protection at the Santee-Cooper project requires a few comments.

Obviously porous concrete slope protection was a great disappointment. The freezing and thawing tests were thought to be the most destructive tests to which it could be subjected, but wave action proved much greater. The cost of repairing will exceed the $2,000,000 saved initially. But Mr. Jewell screens his own organization, then known as PWA, from blame and with studied bitterness criticizes those who were between the jaws of the crusher. When any organization exercises complete control by right of approval and refuses to approve anything until satisfied, the blame is mutual.

Shortly after starting work at Santee-Cooper, without previous knowledge of the project, we were handed our estimate in the form of a letter, doubtless from PWA headquarters in Washington, but with the letterhead clipped off in my presence to permit disclaiming responsibility. I had nothing to do with making said estimate and had never seen it before and yet was told that I must claim it as "*MY*" estimate; that the total could not be increased under any circumstances whatever, although individual items could be varied; that the project must be designed and redesigned until it could be built for this amount. This estimate in the breakdown available elsewhere contained the total amount available for riprap as follows:

Santee-Cooper	91,000 cu yd	$330,000
Pinopolis Dikes	8,000 cu yd	29,000
Pinopolis Dam	18,000 cu yd	66,000
Total		$425,000

This item needed to be stretched to about ten times its size. Yet the project had been repeatedly reviewed and worked over by Mr. Jewell's organization for several previous years. When the issue was raised it was explained that the intention was to use the riprap as far as it would go, where wave action would be worst, and grass the remainder of the 40 miles of earth dam. The only grassing items appearing in the breakdown totaled $6,000, indicating that dependence was to be placed upon natural grass and weeds.

Thus it must be remembered that the organization (although not necessarily the individual), which now bitterly criticizes, in a holier-than-thou manner, the decision to use porous concrete, once thought natural grassing was sufficient for at least 90 percent of the area. Everyone who did business with the PWA in those days realizes the struggle required to get necessary increased appropriations. To the extent that this stimulated maximum economy it was justified, but the border line is likely to be overstepped if the pressure is too great.

We tried to limit economies to items which could later be corrected. For example, a deficient tailrace could be enlarged later, and similarly riprap could be improved. Also, individual penstock gates and individual spillway gate hoists, as well as conversion from fixed gate to Kaplan turbines, could be provided later.

At least one major economy was made under the extreme pressure at Santee-Cooper which would never be tolerated by the more mature government construction departments. For example, the original license called for 10-ft freeboard on all dams and dikes. During construction, the Federal Power Commission very wisely ordered this freeboard increased; the PWA refused to increase it unless it could be done without increasing quantities—which required reducing top width and increasing slopes. Our company, as usual, was in the middle. The resulting 10-ft top width on 30 miles of rolled fill compares with the 30 to 50 ft being used currently on comparable federal government work. Yet we feel this is a justified economy of great magnitude because of the great length of dams and do not expect other than slightly higher maintenance cost. We considered more freeboard a greater contribution to safety than slightly flatter slopes and greater top width.

An entirely novel section of spillway was adopted, containing little over half as much concrete as previous designs on sand foundations. This section has proved so satisfactory that we are using it again in Wisconsin.

Several other such decisions and unconventional designs entered into the Santee-Cooper project, as might be expected in any project designed under a fixed and inflexible budget where first cost exclusively, instead of engineering economics, was allowed to control. It should be recorded, however, that the PWA eventually broke down and added to the original budget. If this had been done sooner, before all major decisions had been made, some features would have been more conservatively designed.

However, the total economy to the project resulting from unconventional designs was doubtless several times the loss on riprap. This is not offered as an excuse, but merely that the reader may know the whole story instead of merely one bad result without its history.

Mr. Jewell appears much surprised that there was so much divergence in opinion regarding riprap among engineers. The writer fought long and vigorously for a competent engineering board with previous extensive experience in riprap problems. Among the members of this board, when finally constituted, there were no serious differences in opinion and a unanimous report was submitted. Resistance to appointment of such a board was the main cause of delay and controversy.

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President, Harza
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Various Methods of Angle Trisection Suggested by Discussers

Dear Sir: The title, "Angle Trisected by Graphical Methods," of an article by James B. Goodwin, M. ASCE, in the January issue of Civil Engineering, aroused momentarily in the present writer the hope that here, at last, was a solution for this famous problem of antiquity. However, only "two methods that present near perfect solutions" were offered.

The problem of angle trisection is, of course, one of the classical trio of geometrical questions first studied intensively by early Greek mathematicians several centuries before Christ. The other two problems are: (1) determination of the length of side of a cube whose volume is double that of a given cube, and (2) squaring the circle. Fairly recently—that is, within the last century or so—rigorous mathematical proofs have been developed to show that the problems are insoluble by strictly Euclidean geometry, in which the only permissible instruments are the compass and *unmarked* straightedge. It is essential to bear in mind these restrictions in connection with Mr. Goodwin's statement that "for many years scientists and mathematicians have tried without success to solve the problem of trisecting an angle, and...it has been proved mathematically that the angle cannot be trisected..." If use of a scale or marked straightedge is permitted (and why not?), the trisection of an angle can be accomplished quite simply by use of the following method.

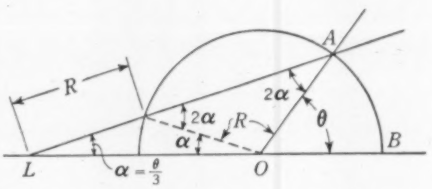

Fig. 1. **GRAPHICAL METHOD for trisecting angle utilizes compass and marked straightedge.**

In Fig. 1, let θ represent the angle to be trisected. With center O and any convenient radius R (e.g., an even number of inches), describe the semicircle shown, which intersects the sides of the given angle at points A and B. Next, employing the scale (or a straightedge, on which is marked the radius R) as a sort of trammel, slide the scale in such manner as to move its left index mark along the horizontal line (side OB continued) while its edge "rolls" on point A. When the intercept on the scale between the horizontal line and the semicircle reaches the value R, mark the position of the left index, L, and draw line LA. The resulting angle α (= $\angle ALB$) is the desired angle, equal to $\theta/3$. Proof of this statement can be derived very simply by application of the theorem that an exterior angle of a triangle is equal to the sum of the two opposite interior angles.

Victor R. Bergman, Assoc. M. ASCE

New York, N.Y.

Editor's Note: Solutions similar to the foregoing have been received from N. A. Carle, M. ASCE, of Seattle, Wash., and Matthew F. Borg, Student Member, ASCE City College Chapter, New York. A similar solution was also suggested by M. E. Von Seggern, of Huron, S.Dak., with the following comment:

"It should be noted, in this connection, that there is nothing new in the trisection of an angle. Any good encyclopedia will show that the ancient Greeks did it by constructing an auxiliary curve called a 'quadratrix.' This little curve will not only divide an angle into any fractional part, but will solve that other old Euclidean classic of squaring the circle. There is another type of auxiliary curve called a 'trisectrix,' which also does the trick."

Similar to Mr. Bergman's method is the following solution by Leonard C. Jordan, M. ASCE, which involves the use of trigonometry.

Dear Sir: Since the trisecting of an angle is always a puzzle, a method suggested by a friend some time ago may be of interest to readers of Civil Engineering.

To trisect the angle ABC shown in the accompanying sketch, on the line AB lay off any convenient distance BD and call it "K." From D draw lines horizontally and vertically. Then draw the line BF in such manner that the part EF is equal to $2K$, dividing the angle ABC into two parts x and y. The angle x will be one-third of the original angle ABC, and the angle y can be bisected to complete the job.

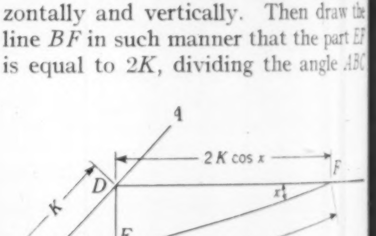

FIG. 1. **TRISECTION OF angle ABC is easily proved by trigonometry.**

The proof by geometry we will leave to Prof. N. G. Neare. But the proof is quite simple by trigonometry. In the triangle BDF we have $\frac{\text{Sin } y}{\text{Sin } x} = \frac{2K \text{ Cos } x}{K}$, which reduces to Sin $y = 2$ Sin x Cos x, or Sin y = Sin $2x$. Thus $y = 2x$.

Drawing the line BF by exact geometric methods presents the real difficulty of the job—another problem for Professor Neare.

Leonard C. Jordan, M. ASCE
New Rochelle, N.Y.

To the Editor: I noted with interest the graphical methods for angle trisection, suggested by James B. Goodwin, M. ASCE, in the "Engineers' Notebook" section of the January issue.

Another approximate method is available, as shown and explained in Fig. 1. Slide rule check indicates that the error in this method is less than 1 percent.

A trial method is available for large angles, which may be as exact as the tools and eyes of the draftsman will permit. This method is diagrammed and explained in Fig. 2.

Neither of the methods is sufficiently concise to serve as a time-saving aid to the draftsman, so the protractor will probably continue in use for angle trisections.

It is possible that some reader may wish to investigate the matter further, so the following may be of interest:

Using cartesian coordinates with the chord as X-axis and a perpendicular at the one-third point as the Y-axis (as shown in Fig. 1), the theoretical curve of all points that trisect arcs with ab as chord is $y^2 = 2x + 3x^2$, between limits $x = 0$ and $x = 1/12$ with length of chord equal to 1; and the equation of circle drawn in Fig. 1 with h as center is $(x - 1.3329)^2 + (y + 0.0320)^2 = (1^1/_3)^2$, with length of chord equal to 1.

John O'Farrell, Assoc. M. ASCE
Norfolk, Va.

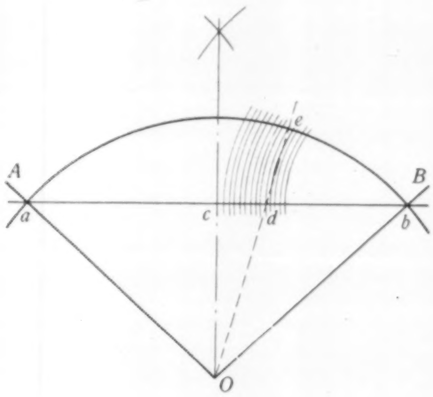

FIG. 2. IN TRIAL METHOD for any angle *AOB*, draw convenient arc $\widehat{ab}$ and chord *ab*. With *b* as center, draw closely spaced arcs in near half of middle third of segment, each arc intersecting arc and chord *ab*. By inspection draw straight line through O and points of intersection of one of arcs and chord *ab* and $\widehat{ab}$. Line *Ode* then divides $\widehat{ab}$, making $\widehat{eb} = {}^1/_3\widehat{ab}$.

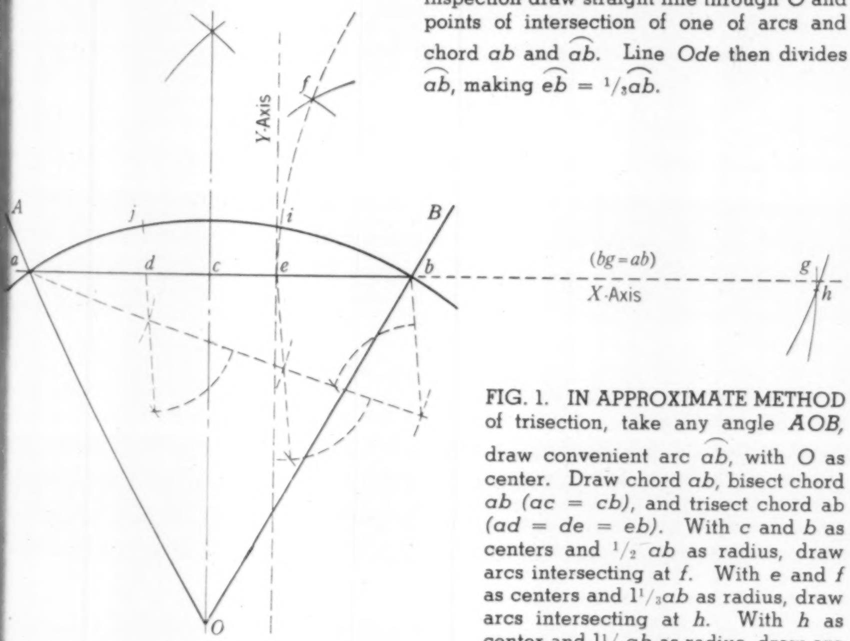

FIG. 1. IN APPROXIMATE METHOD of trisection, take any angle *AOB*, draw convenient arc $\widehat{ab}$, with O as center. Draw chord *ab*, bisect chord *ab* (*ac* = *cb*), and trisect chord ab (*ad* = *de* = *eb*). With *c* and *b* as centers and $^1/_2$ *ab* as radius, draw arcs intersecting at *f*. With *e* and *f* as centers and $1^1/_3ab$ as radius, draw arcs intersecting at *h*. With *h* as center and $1^1/_3ab$ as radius, draw arc $\widehat{ef}$. Intersection of $\widehat{ef}$ with $\widehat{ab}$ cuts off $\widehat{ib}$, which is one-third of $\widehat{ab}$. Then lay off $\widehat{ij}$ equal to $\widehat{ib}$, and $\widehat{ib} = \widehat{ij} = \widehat{ja} = {}^1/_3\widehat{ab}$ (approximately).

Dear Sir: With reference to Mr. Goodwin's article, "Angle Trisected by Graphical Methods," in the January issue of Civil Engineering, I believe it is erroneous to state that the angle "cannot be trisected graphically." There is a method which, although not Euclidean, is no less graphical and more practical and conclusive than Mr. Goodwin's.

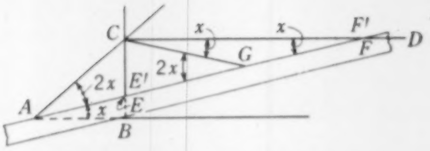

FIG. 1. **ANGLE *BAC* is trisected graphically.**

On one side of angle A, shown in the accompanying Fig. 1, erect a perpendicular at any convenient point B, intersecting the other side at C. Draw line CD parallel to AB with a length about twice AC. On a straightedge (a strip of paper will do) radiating through A, mark points E and F at twice the distance AC. Simultaneously bring to coincidence point E with line BC and point F with line CD while the straightedge remains at A. Transfer point, or mark, E to E' and F to F', and draw line $AE'F'$. Angle BAE', or BAF', is one-third angle BAC. Euclidean geometry can be used now for the proof.

On right triangle $F'CE'$ draw median CG. Since the resulting triangles are isosceles, all angles are related to each other in terms of x, so that angle $BAC = 3x$, and angle $BAF' = x$.

If the angle to be trisected is an obtuse angle, first bisect the angle, then trisect one of the halfs, and then $2x$ = one-third the given angle.

G. F. Ramirez, Assoc. M. ASCE
New York, N.Y.

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Life Member Describes Engineering in China

Dear Sir: The experiences of one who has reached the life membership status in the Society, after spending his useful years in the engineering profession in the Orient may be of interest to young engineers contemplating foreign service.

I came to China in 1911 and, through my association with The Texas Co. (China) Ltd., I have worked in China, the Philippines, Indo-China, Malaya and Ceylon. I have had numerous contacts with governmental agencies, engineers and the labor of these countries and have been favorably impressed with the ability of some of the professional men educated only in their local colleges. In fact, in Shanghai engineers educated in government or mission colleges make up our major technical staff, and in surveys, drafting and designing they are excellent. However, they have not proved as satisfactory in the organization and handling of field operations, and I attribute this deficiency to the fact that those who can acquire an education come from a strata of society where they have had no contact with physical work or play such as the average American boy experiences in his teens.

Practically all of my professional life has been spent in the Orient. My principal contact with engineering progress has been through the American Society of Civil Engineers and through contact with American engineers who have come to China on advisory work—among them such eminent members of the Society as Prof. Daniel W. Mead, Past-President and Honorary Member, John R. Freeman Past-President, etc.

Membership in a major technical society in the United States is almost obligatory before an American engineer can obtain a license to practice engineering in this country. Membership in the Society, in addition to its technical benefits, has more significance in these Oriental countries than in the United States. The reason for this is the fact that the continental professional man lists on his calling cards his affiliations with technical and social organizations in his native land, and the Oriental has thus been educated to the idea that the more affiliations shown on a calling card the greater the status of the caller must be. Accordingly we American professional men must impress upon our clients our importance in a similar manner and we carry two cards, on one of which we show in English and the language of the country all the affiliations we have, while on the other we have a simple calling card for ordinary social use. An outstanding example of the confusion of the Oriental mind occurred when the Japanese Military processed and actually imprisoned members of the Masonic Lodge during the early part of the war because they considered them members of a secret government society. I would not have been surprised to have them take the same attitude with respect to our professional society membership.

E. C. Stocker, M. ASCE
Shanghai, China

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Voices Thanks for ASCE Public Speaking Class

Dear Sir: I want to express my appreciation to the Junior Branch of the Metropolitan Section of ASCE for sponsoring a very valuable and excellent course in effective speaking for engineers. Some of the helpful pointers I received were those having to do with subject selection, means of vitalizing technical subjects through effective use of voice, gestures and emotion, and a sustained interest through careful maintenance of eye contact between the speaker and audience so that the listeners' attention will not wander.

Injection of a "human interest" element into technical discussions through verbal attention to personalities involved in an experiment or an engineering project will make the engineering facts of interest, even to a lay person in the audience. Use of charts, drawings and blackboard sketches, so valuable in emphasizing a discussion, was ably analyzed in the ASCE class.

Brendan O'Hara
Brooklyn, N.Y.

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Civil Engineers Cited for Administrative Ability

Dear Sir: On receiving the January issue I turned first—as usual—to the nontechnical pages and read with interest Mr. Girand's analysis of the EJC report, "The Engineering Profession in Transition." This has suggested the following comments.

From paragraphs 4 and 5 it appears that successful (or well-paid) engineers do not practice engineering—"are not engineers in the popularly accepted concept of the word." It is suggested that business administration be included in the engineering curriculum. More education—that is, school work—is urged for engineers. The curriculum should be extended to five years. Civil engineers are the lowest paid of all engineers, and one reason is because they "do not have the educational background of other engineers." Specifically, there are fewer master and doctor degrees among civils than in other categories. Mr. Girand emphasizes school work as the key to reward in engineering (note in the same issue of Civil Engineering an offer of a position paying $2,600–$3,400 to the holder of a master's degree" plus considerable experience"). Further, he stresses the point that an engineer who attains to sufficient responsibility to be paid $20,000 a year may be considered no longer an engineer.

I disagree on both counts. Away with the idea that more and more classwork makes a better and better engineer. However able his instructors, the young graduate still faces the serious task of learning his profession in the school of experience—the only one. Let him be about it with the least possible delay. The man at the top is not commonly the most wedded to academic methods, the most impressed by academic attainment. Rewards are for those who can get things done, who can get others to do things—whether or not they themselves know how.

It is quite true that civil engineers are paid less than chemical or electrical engineers. But regardless of how many degrees a civil engineer tacks after his name, isn't it a fact that essentially his services are classed as "overhead"? In contrast, the work of a chemical or electrical engineer in industry is actually part of "production." The civil engineer doing valuable work is not usually producing direct profit for the party who foots the bill. A chemical engineer more than likely is in a position to boost dividends for a great corporation. Certainly financial reward is likely to favor the one whose efforts can be traced directly in the profits of industry.

More power to Mr. Girand's pleas for inclusion in our periodical literature of material dealing with administrative problems. It is high time to recognize the fact that the engineer is more than an expert manipulator of slide rule and transit. His stature in the present day is not going to be increased by spreading the notion that engineering is synonymous with technology. The world will hardly grant him recognition or reward if he claims to be only a technical adviser rather than the director of great undertakings.

A. S. MacGregor, M. ASCE
Buffalo, N.Y.

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Technical Books Wanted for Institute in Finland

Dear Sir: I have been informed by Arthur E. Morgan, member of the American Friends Service Committee, that he has submitted to Civil Engineering a letter on our Institute of Technology and the need for contributions to its library [December issue, page 49]. As the president of the Institute of Technology, I wish to express our thanks for your cooperation in publishing the letter.

Our institute is the only one of its kind in our country for preparing engineers and architects to graduate with recognized degrees in the different technical branches. The paying of war indemnities and the reconstruction of the country are making great and increasing demands on our industrial activities. To meet the greatly increased demand for engineers and architects in the years since the war, the Institute has been obliged to increase its output of graduates while, at the same time, endeavoring to maintain a high standard of teaching.

Our library, consisting of about 80,000 volumes, was completely destroyed by bombing. We have now begun to rebuild the library, both through purchases and donations, and it already contains about 40,000 volumes. It is our purpose to create a technical central library for the use of the Institute of Technology as well as the research institutes and industry. However, the difficulty of getting foreign funds prevents the acquisition of foreign literature and periodicals. We are, therefore, especially appreciative of the contributions we receive.

Martti Levo
Helsinki, Finland

SOCIETY NEWS

EDITORIAL:

Professional Affiliation

TWO ARTICLES IN last month's issue of CIVIL ENGINEERING focus attention on Society membership, its value, and the much-discussed question of whether Local Sections should invite applications or wait for potential ASCE members to apply.

In his inaugural remarks, President R. E. Dougherty left no doubt as to his position:

"I believe that the days of complacency and happy security when the Society could afford to wait for prospective members to apply, have gone. It would be my suggestion that the Local Sections make strenuous efforts to increase the Society's membership by interesting and inviting applications from the leading engineers in their territories. If the leading men respond, the younger men are likely to follow."

This reference to younger prospective members is particularly timely, in view of the sentiments expressed in another article in the February issue of CIVIL ENGINEERING by many who received Life Membership certificates at the beginning of 1948. For in the letters received at Society Headquarters from the new Life Members, there is enunciated in clear terms the answer to the question many a young engineer asks himself: "How soon should I affiliate with my national professional society?"

From the number of these "old-timers" who expressed the reaction that "it seems only yesterday" that they affiliated themselves with the ASCE, the answer would appear to be that youngsters should become associated with the Society as soon after graduation as practicable. Further corroboration is furnished by the many who conveyed "regrets" that they had not been more active in Society affairs and who looked back upon failure to participate more extensively as "lost opportunities."

As for another common self-interrogation: "What do I get out of Society membership?" the responses from the Life Members contain adequate answer to that one, too. By their references to the intangibles being "beyond price," to the many lasting friendships made and the sound technical and professional benefits derived, they indicate they consider their membership not only well worth while, but all too brief—this despite the fact many had enjoyed membership for thirty-five years.

In President Dougherty's words, Local Sections and their membership committees should be inspired to active, rather than passive, conduct. And in the experiences of the Society's older members they should find abundant guidance for those younger engineers who, in their youth, may not yet clearly see the advantages of professional affiliation.

First California Joint ASCE Meeting Is Set for April

THE FIRST CALIFORNIA conference of members of the ASCE, sponsored by four Local Sections, will be held April 23–24 at the California Hotel, Fresno. Participating in the two-day meeting will be the Sacramento, San Francisco, Los Angeles and San Diego Sections, together with their six sponsored Student Chapters at the Universities of Nevada, California, and Southern California, Stanford and Santa Clara universities, and the California Institute of Technology.

ASCE President R. E. Dougherty will speak at a dinner meeting for members and their wives. There will be an inspection trip to the Pine Flats Dam site, a student paper competition, a program devoted to professional and technical papers on water problems of particular interest to Western engineers, a meeting devoted to state and regional councils of engineering societies, and a discussion meeting dealing with means of improving the California registration law for professional engineers.

H. H. Wheaton, Assoc. M. ASCE, is chairman of the Fresno Engineers' Club sponsoring committee; S. T. Harding, past-president of the San Francisco Section, is chairman of the technical and professional program, and Richard C. Clark, president of the Stanford University Student Chapter, is in charge of student preparations for the conference. Each Local Section is sponsoring student travel to the meeting and making provision for low cost housing and eating facilities for students.

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Committee to Aid EJC Member on UNESCO

TO COOPERATE WITH the U.S. National Commission for UNESCO, Engineers Joint Council has authorized appointment of a committee of counsellors to advise Dr. Robert M. Gates, president of the ASME, in his capacity as EJC representative on the Commission.

Appointees to the committee of counsellors are: Col. Richard H. Tatlow, III, M. ASCE, Dr. Harold C. Dean, George C. Heikes, Dr. Augustus B. Kinzel, Dr. Albert B. Newman, Brig. Gen. Stewart E. Reimel, Clifford S. Strike, all of New York, and Ralph L. Gotzenberger, of Washington, D.C.

Constitutional Amendment to Increase Dues Advocated by 26 Sections

ACTION TAKEN BY the ASCE Board of Direction at its quarterly meeting in January is detailed in the following letter, which has been sent to the presidents and secretaries of Local Sections:

"Twenty-six Local Sections have officially expressed a desire that an amendment to the constitution providing an increase in Society dues be voted on as soon as practicable. Copies of tentative forms of petitions which originated in Local Sections, to request a ballot, have reached the Headquarters office.

STEPS FOR AMENDMENT OF ASCE CONSTITUTION

AMENDMENT of ASCE Constitution is provided in Article X of the Constitution. Following is a step-by-step outline of that procedure.

1—Membership submits petitions signed by 75 or more Corporate Members in each Zone.
2—Notice of Amendment thus petitioned is sent to all Corporate Members prior to a Business Meeting of the Society.
3—Amendment is considered at Business Meeting of the Society. (Not a Board Meeting.) Amendment may be changed at Business Meeting but changes must be pertinent to the petition.
4—Ballots on amendment as approved at Business Meeting sent to all members.
5—Ballots returned and counted. Two-thirds of all ballots cast necessary for adoption of the amendment.

"In view of the widespread movement, it is evident that differently worded petitions may be circulated simultaneously and that there will be confusion and delay unless the activities are coordinated. Therefore, the Board of Direction, at its January meeting, deemed it wise to endorse the wording of what was considered the most appropriate form that has come to its attention.

"The Tennessee Valley Local Section has prepared a form of petition looking to an increase in dues and also one directed toward abolishing the current differential in dues. For the purpose of keeping possible confusion of petitions to a minimum the Board endorsed the wording of Tennessee Valley Section Petition No. 1 in the form proposed, as follows:

Petition No. 1

AMERICAN SOCIETY
OF CIVIL ENGINEERS

ZONE——

PETITION FOR
CONSTITUTIONAL AMENDMENT
INCREASE IN DUES

We, the undersigned Corporate and Junior Members of the American Society of Civil Engineers, resident within Zone ———, do hereby petition the Board of Direction to submit to ballot, pursuant to Article X of the Constitution, a Constitutional amendment to the pertinent sections of the Constitution which will provide for:

(1) **An increase of five dollars ($5.00) a year in the dues of Members, Associate Members and Affiliates.**

(2) **An increase of two dollars and fifty cents ($2.50) a year in the dues of Juniors.**

NAME GRADE ADDRESS

A modification of Tennessee Valley Section Petition No. 2 was considered advisable, with the result that the Bo endorsed the following wording:

Petition No. 2

AMERICAN SOCIETY
OF CIVIL ENGINEERS

ZONE ——

PETITION FOR
CONSTITUTIONAL AMENDMENT
EQUALIZATION OF DUES

We, the undersigned Corporate a Junior Members of the American Soci of Civil Engineers, resident within Zo ———, do hereby petition the Board Direction to submit to ballot, pursuant Article X of the Constitution, a Consti tional amendment to the pertinent se tions of the Constitution which will p vide, contingent upon adoption of t constitutional changes proposed in Pe tion No. 1, that:

The annual dues payable by Membe Associate Members, Affiliates and Juni members within the District No. 1, sh be the same as those payable by corr sponding members residing outside Di trict No. 1.

NOTE: Petition No. 1, referred to abov provides for

(1) **An increase of five dollars ($5.0 a year in the dues of Members, Associ Members and Affiliates.**

(2) **An increase of two dollars and fi cents ($2.50) a year in the dues of Junior**

NAME GRADE ADDRESS

"The Board added the 'continge clause in Petition No. 2 for obvio reasons and in the belief that it is accord with the intent of the framers the petitions.

"The Society's Constitution provid for prompt procedures to be follow upon receipt, at Society Headquarte of any petition received carrying not le than seventy-five (75) member signatur from each of the four Zones of the Societ

"The Board of Direction, at its Januar 1948 meeting, instructed the Executi Secretary to bring to the attention of a Local Sections for their information, t matters contained in this communicatio

ASCE Policy Stated on Use of Engineers Employed by Units of Government

THE AMERICAN SOCIETY of Civil Engineers has a membership of over 20,000, employed in all phases of our political economy, including responsible positions in government—national, state, county and municipal, and including also those engaged in technical instruction and in the private practice of engineering. The Society recognizes that, because of the diversity of its professional activities, its national standing and the fact that it represents the great majority of Civil Engineers in the United States, it believes that it has a clear responsibility to perform in respect to the profession and the various public agencies.

1. The Society is particularly concerned with the administration of those agencies having engineering duties or related tasks to perform and believes that to the best of its ability, it should see to it that such administration is carried out in the best interests of both the public and the profession.

The Society therefore will cooperate to the fullest extent with the heads of all Government Agencies employing engineers to the end that the above responsibility may be met, but will take appr priate action whenever the interests of th public and the profession are advers affected.

2. The Society recognizes that withi certain Governmental institutions, su as the technological departments of o universities, there are employed En neers of special technical skill, whose a vice is sought by both private and Go ernmental agencies. The Society b lieves that this specialized talent shou be available only to those seeking it a that such services should not be offer or rendered except with the knowled and consent of the institutional authori The Society does not, however, appr of such engineers maintaining a priva

office and a staff either by themselves or with others in direct competition with engineers not in the public employ.

3. The Society recognizes that there are in some of the Government Bureaus administrative positions which carry a highly technical responsibility. The Society points out that these positions are frequently filled by men with no engineering training, and that such lack of technical qualification works to the disadvantage of the general public as well as the Bureau concerned, of the engineering employees of the Bureau and lowers the prestige of the engineering profession. The Society recommends that such administrative positions, especially those that supervise large numbers of engineers, should be filled by men of suitable technical training. The Society will therefore use its best efforts to encourage this policy.

4. The Society recognizes that during peace times, the army and navy and air forces should be maintained and trained in the art of warfare; but it believes also that it is essential to maintain a strong group of engineers in private practice. The Society also recognizes that there are certain types of engineering projects, in which the public interests may be best served, by doing the work of engineering with the staffs of the responsible Bureaus. The Society is pleased to note that many of the Governmental Agencies have already adopted a policy of contracting with private engineers to furnish technical services. The Society desires to use its best efforts to maintain these relations.

5. The Society has observed that, frequently, certain Governmental Agencies have engaged in the promotion of, and negotiations for, engineering work of Irrigation, Drainage, Land Reclamation, Power, Water Supply, Air Ports, Housing and other projects, to the end that the engineering staffs of the Agencies may be continuously employed. The Society does not believe that the best interests of the public are served in many of these instances, especially in the medium and smaller sized projects, and will use every effort to discourage similar practices in the future.

6. The Society recognizes that within certain Governmental Agencies, there are administrative problems that may relate largely to staff procedure, office locations, territorial responsibility, etc., and that may affect the economic status of its engineer employees. The Society believes that, so long as the individual engineer employee is accorded opportunities for professional advancement, and so long as the effectiveness of the engineering staff is not weakened by the proposed changes, the Society should take no cognizance of such administrative or organizational matters.

7. The Society recognizes that it is in the interest of the Government of the United States that the best technical information and the best qualified talent in the country be made available to other nations requesting services needed to solve their domestic engineering problems, and that this assistance may require the temporary assignment of properly qualified individual specialists, selected either from government service or private enterprise, as advisers to other governments together with such assistance as may be necessary for the accomplishment of their individual assignments; however, the Society does not believe that any Federal Agency should be permitted to prepare engineering designs, plans and specifications for, or engage in supervision or construction of, projects for foreign governments unless the national interest demands otherwise. The Society will therefore exert every effort to obtain compliance with the above policy in connection with requests from foreign government for technical services.

Who Is He?

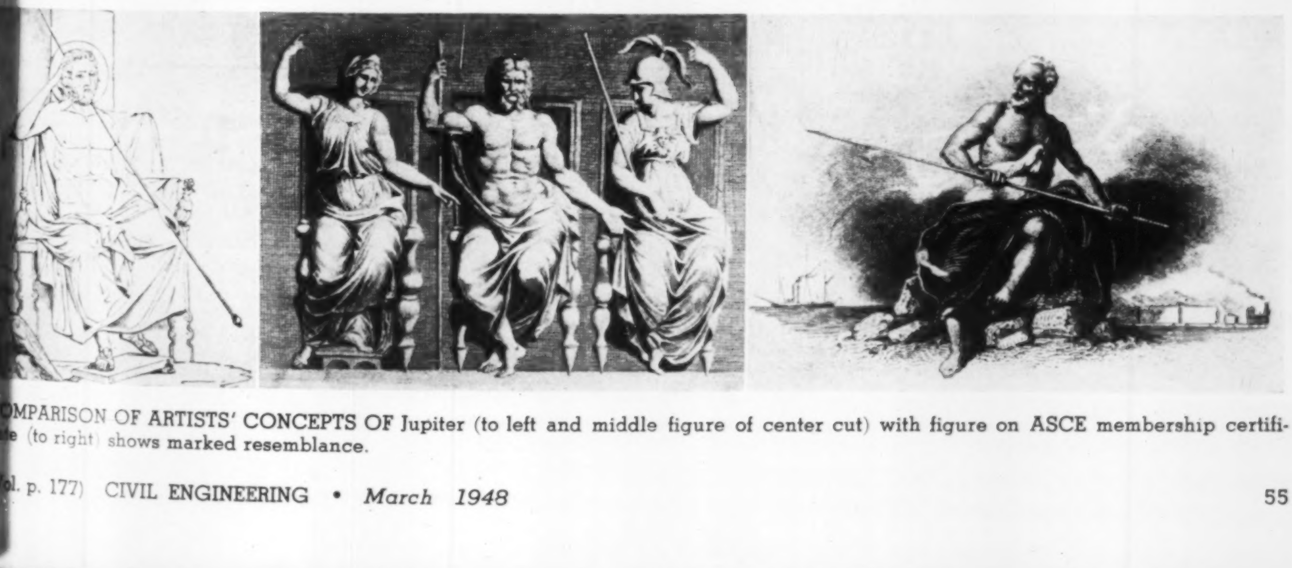
WHO IS THE partly clad, well-fed gentleman pictured on the ASCE membership certificate? D. R. W. Wager-Smith, a member from Silver City, N.Mex., asked that question last July. T. Kennard Thomson, a New York ASCE member since 1888, was put on the trail of the answer, but no identification was made.

Available histories of the Society are silent on the subject of the origin of the ASCE membership certificate. The Engineering Societies Library, the New York Public Library, and the Metropolitan Museum of Art have no duplicate of the ancient seated in the foreground of all membership certificates.

As a result of his researches, Mr. Thomson is inclined to the opinion that old pictures of Jupiter were used as the model for the engraving. Certainly there is a resemblance, as can be seen by comparing the illustration on the membership certificate with the two selected cuts of Jupiter shown.

The background of the steamship and the locomotive on the certificate can be charged to artistic license if the man on the certificate represents Jupiter. However, if he is supposed to be current with the methods of transportation shown, perhaps he symbolizes what one of our forefather engineers had left for himself after building railroads or ships—i.e., a rod, a long beard, a few clothes, and a rock on which to sit.

The best sleuths and Nick Carters around Society Headquarters have failed to identify the venerable gentleman with the toga who adorns our membership certificate. Who is he? Is the curiosity kindled in Silver City, N.Mex., and fanned to flame in the Engineers Club in New York, to go unsatisfied? Does the engraving represent Jupiter or one of the early members of ASCE or someone else? Who is he?



COMPARISON OF ARTISTS' CONCEPTS OF Jupiter (to left and middle figure of center cut) with figure on ASCE membership certificate (to right) shows marked resemblance.

Close Relationship Between Engineers, Contractors Is Stressed

Construction Division Luncheon Speakers Emphasize Need of Cooperation

CARLTON S. PROCTOR
Vice-President ASCE

D. W. WINKELMAN
President, A.G.C.

ENHANCEMENT OF THE close relationship between design engineers and general contractors, and the need for leadership by the engineering profession in world affairs, were stressed by two speakers at the Construction Division luncheon held at the Hotel Commodore, New York, during the 95th Annual Meeting of the ASCE. Speakers emphasizing these points, respectively, were Dwight W. Winkelman, president of the Associated General Contractors of America, head of the Syracuse, N.Y., contracting firm bearing his name, and Col. Carlton S. Proctor, Vice-President ASCE, New York City consultant.

Calling design engineers and general contractors "parts of a team working toward the same objective—better construction for a more economical cost," Mr. Winkelman hailed the fact that "the majority of key men in contractors' organizations" are engineers.

"A number of members of your Society whose companies are a part of the Associated General Contractors were among those who took the lead in organizing the ASCE Construction Division," Mr. Winkelman said. "Members of your Society, who were prominent in contracting organizations, also helped in founding the A.G.C. The functions of design engineers and general contractors are complementary. As members of your group have described the relations very effectively in the past, the engineer, the contractor, and the owner form parts of a triangle, all of whom are essential to the completion of a construction project.

"From personal experience I can state that some of the best men in my organization have, at one time or another, been design engineers. Also, some of the jobs I have been able to build with the greatest speed and efficiency have been those on which the engineers had previous experience in the construction field. I believe that our two groups should work toward a system which would permit the exchange of engineers between design and administration organizations on the one hand, and contractors' organizations on the other. I believe that every effort should be made to permit design engineers to get into the field long enough so that they could talk with men in a contractors' organization and become intimately familiar with new methods being devised.

"I suggest that the ASCE and the A.G.C. give consideration to the appointment of a standing committee which, on an organized but still informal basis, would have the specific duty of cooperating with the other group."

In discussing how the ASCE membership and the engineering profession "can and should exercise a definite influence on the future of construction activities," Colonel Proctor said there is an avenue to be traveled "by those of us who are first and foremost American citizens before we are engineers and engineering contractors—men whose primary interest is in the overall public welfare."

Colonel Proctor continued: "This avenue has been heavily traveled by our profession during periods of our nation's warfares, but too little used in peacetime. Our professional Society was on this avenue when, with the four other founder engineer societies, we provided the Engineers National Defense Board and the National Engineers Committee. We are now progressing along this thoroughfare in our support of the day-to-day work of Engineers Joint Council and its committees for service to nation and mankind. This path leads to the coordination of the engineering profession and the prerequisite basis for integrated construction industry planning of a program desig for national welfare and internation peace and prosperity."

Asserting that strength through uni is nowhere more applicable than in th engineering profession, Colonel Proc suggested the following plan of action:

"A knowledge of what Engineers Joi Council has done, is doing, and is plan ning, as a prerequisite to the organizati of similarly coordinated activity and uni fication of action between the sever branches of engineering in the larg communities throughout the country.

"Encouragement of the necessary al location of essentials of construction t Europe, even though this may mea temporary shortages in our domesti program.

"Leadership in attaining increased pro duction and maximum efficiency by virtu of the confidence the engineering profes sion merits both from management an labor.

"Gearing of America's domestic con struction program to the program i European reconstruction, and trimming o bureaucratic burdens and obstruction alism by elimination of restriction against, or resistances to, improvement in construction materials and method leading to increased efficiencies a economies.

"Postponement of public works tha are not immediately essential to minim competition for scarce construction ma terials, labor and equipment."

Meetings of Board of Direction, January 19–22, 1948

Annual Report

The Board of Direction approved the Annual Report prepared by the Executive Secretary for the fiscal and the calendar year of 1947. The report showed a net increase in membership in all grades during the year of 882. Total membership in the Society as of December 31, 1947, is recorded as 21,866. The report showed receipts in the amount of $641,819 and expenditures of $689,392, a deficit of $47,573. In setting up th budget for 1947, the Board anticipat a deficit of $56,000. For 1948 the Boa adopted a balanced budget which anti pates keeping expenditures for 1948 wit in the limits of current income.

Constitutional Amendments

During the year an amendment to th Constitution enfranchising Juniors w made. An amendment to raise dues w lost.

Section Allotment Complaints

er considering complaints received six of the 68 Local Sections regarding orced reduction of allotments to Sections, the Board directed the tive Secretary to advise all Local ns along the following lines:

"That the Board of Direction der itself bound for the present by t and formula covering Local Sec- as adopted at the October 1947 ing.

"That the matter of Local Sections ula and allotments is referred to the Committee on the Budget, in collaboration with the Committee on Local Sections, for a report on this subject at the April 1948 Meeting.

(c) "That the Board proposes to increase Local Section allotments as soon as the finances of the Society will permit."

New Petitions for a Dues Increase Amendment

Twenty-six of the 68 Local Sections, at the time of the January meeting of the Board, had gone on record in favor of resubmitting to the Society an amendment to increase dues. Petitions originating in several of the Sections were considered by the Board, and the wording of petitions originating in the Tennessee Valley Section was approved by the Board. The Executive Secretary was instructed to bring to the attention of all Local Sections the proposal for new petitions on dues and the wording of the petitions which was approved, with a view to reducing confusion.

New Foreign Sections

The Board approved the constitution of a new Local Section in Venezuela, with headquarters at Caracas, and also authorized the formation of a new Local Section in Brazil.

U.S. Committee on Large Dams

The Board agreed to name as many members as practicable to represent the Society at Stockholm in June 1948 at the World Conference on Large Dams, such delegates to serve without expense to the Society. Two members of the present Board, Vice-President Gail Hathaway and Director Joel D. Justin, are among the Society members who expect to be representatives of the ASCE at the Stockholm Conference.

Committee on Meetings

Upon recommendation by the Committee on Meetings, the Board appointed a Board Contact Member to serve with the Annual Meeting Committee of the Metropolitan Section.

A change in the yearly program was recommended to provide for three general meetings of the Society during the year instead of four as at present. This plan, if adopted, eventually would place the Annual Meeting in New York late each October, two other meetings following at approximately four-month intervals.

Committee on Application Classification

New, modernized procedures established late last year relating to admissions were reported on by Director Haertlein. He stated that the new procedure was operating in a highly satisfactory manner resulting in shortening the time required for review of membership applications.

Policy on Use of Engineers Employed by Units of Government

During the past two years the Board has considered reports by various committees regarding the use of engineers employed by units of government, both federal and state. Out of these reports and their consideration by the Board came a statement of policy adopted by the Board at the January meeting. The statement is published separately on page 54 of this issue.

Fees for Consultants on Government Work

The Executive Secretary was instructed to explore current practices of governmental agencies relative to fees for per diem services of outside consultants. Effort is to be directed toward convincing governmental bureaus that public interest can best be served through payment of current and customary per diem fees to the engineering consultants occasionally employed.

New Board

A short meeting of the incoming Board was held on Thursday, January 22.

Petitions to Increase Dues

The new Board concurred in the action taken by the outgoing Board relative to petitions for changes in the Constitution providing for an increase in Society dues.

New Members

More vigorous efforts to obtain qualified new members were discussed. President R. E. Dougherty urged every Board member and every Local Section to take energetic steps to invite qualified engineers to become members of the Society.

WEDNESDAY LUNCHEON SPEAKERS at recent Annual Meeting of Society in New York chat together between speeches. Shown, in usual order, are: M. Kabir Ludin, Assoc. M. ASCE, Minister of Public Works, Kabul, Afghanistan; W. L. Batt, president of SKF Industries, Philadelphia, and ASCE President R. E. Dougherty, New York.

J. E. Jagger Resigns Post as Assistant Secretary ASCE

JAMES E. JAGGER, for the past three years Assistant Secretary of ASCE, has resigned that position to become general manager of the International Association of Fire Chiefs. He has been a member of the Headquarters staff of the Society since August 1941, and has served successively as Field Secretary, Acting Assistant Secretary, and since July 1945, as Assistant Secretary.

James E. Jagger

In his new position, Mr. Jagger will be in charge of the national headquarters in New York for the 75-year-old organization of fire chiefs, and will conduct a program of expanded activities.

◆

First 1948 Dues Petitions Received at Headquarters

TO THE DISTRICT of Columbia Section goes the distinction of submitting the first 1948 petitions received at Headquarters for a constitutional amendment to raise Society dues. Twenty members signed each of two separate petitions, one to raise dues and the other to abolish the New York area dues differential.

◆

Supplemental Report Issued on Practice of Employers

A SUPPLEMENTAL REPORT of the Engineers Joint Council Committee on Employer Practice Regarding Engineering Graduates (see CIVIL ENGINEERING for April 1947, page 57, for the report of the committee's preliminary survey) has been completed. This report includes comparative analysis of the report of the EJC Committee on the 1946 Survey of the Engineering Profession, "The Engineering Profession in Transition." Copies of the supplemental report are available at ASCE headquarters

NOTES FROM THE *Capital*

E. LAWRENCE CHANDLER, M. ASCE

Eastern Representative, ASCE

AT LEAST ONE positive action of the second session of the 80th Congress to date is of special interest to members of the Society. Public Law 402, the "United States Information and Educational Exchange Act of 1948," is the outgrowth of the Bloom-Mundt-Smith bills, the first of which originated in the 79th Congress. Representatives of Engineers Joint Council were called upon to confer with the Department of State in arriving at appropriate wording of the portions of the Act which deal with technical services. By request, Malcolm Pirnie, Past-President ASCE, testified before the House Committee on Foreign Affairs and advocated enactment of the measure.

* * *

S. 2031, known as the "Professional Engineers' Registration Act" for the District of Columbia, has been introduced in the Senate. It is an exact counterpart of H.R. 4884, to which attention was called in the February issue of CIVIL ENGINEERING. No hearings on either of these bills have been scheduled as of this writing.

* * *

No bill for creation of a National Science Foundation has yet been introduced in the Senate, although it is expected that appropriate legislation will appear soon. Such a bill would be a companion to H.R. 4852.

* * *

Senate debate on the provisions of S. J. Res. 111, relative to development of water potentialities of the St. Lawrence River, has brought forth ardent arguments both pro and con.

* * *

Hearings are in progress regarding appropriations for construction programs of several federal agencies, with the Congress evidencing an intension of cutting down the large sums requested by the agencies.

Reprints of Technical Papers Now Available

FOR THE INFORMATION of non-members, and for those members who do not receive the annual bound volume of TRANSACTIONS, the following list of recently stocked reprints from Volume 111 may be of interest:

PAPER No.	TITLE	AUTHOR	PRICE
2266	Evaporation From a Free Water Surface (J. C. Stevens Award to Discussion by Maurice L. Albertson)	G. H. Hickox	$0.90
2267	Transportation of Suspended Sediment by Water	Vito A. Vanoni	0.90
2268	Analysis of Statically Indeterminate Structures Using Reduced Equations	Lee H. Johnson, Jr.	0.50
2269	Column Formulas	William R. Osgood	0.50
2270	The Effect of Blankets on Seepage Through Pervious Foundations	Preston T. Bennett	0.40
2271	A Plan for a Movable Dam	Isaac DeYoung	0.35
2272	Utilization of Ground-Water Storage in Stream System Development	Harold Conkling	0.80
2273	Conversion of Kinetic to Potential Energy in Flow Expansions (The Karl Emil Hilgard Prize)	A. A. Kalinske	0.40
2274	Interrelation of Certain Structural Concepts	Camillo Weiss	0.50
2275	Stresses in the Linings of Shield-Driven Tunnels	Anders Bull	0.90
2276	Flow in a Channel of Definite Roughness	Ralph W. Powell	0.40
2277	Economics of Photogrammetry	Leon T. Eliel	0.30
2278	Flow from Drainage Basins Determined by Short-Term Records	Lloyd L. Harrold	0.20
2279	Elimination of Cross Connections in Los Angeles, California	Harry Hayes	0.40
2280	Computing Coagulant Requirements in Sludge Conditioning (Rudolph Hering Medal)	A. L. Genter	0.45
2281	Determination of Pressures Within a Siphon Spillway	I. M. Nelidov	0.30
2282	Design of Roadbeds	Ira B. Mullis	0.45
2283	Deterioration of Concrete Dams Due to Alkali-Aggregate Reaction (The Thomas Fitch Rowland Prize)	R. F. Blanks and H. S. Meissner	0.65
2284	Moving Loads on Restrained Beams and Frames	R. C. Brumfield	0.95
2285	Sedimentation and the Design of Settling Tanks (J. James R. Croes Medal)	Thomas R. Camp	0.65
2286	Mathematical Examination of the Highway Transition Spiral	John O. Eichler and Howard W. Eves	0.50
2287	Structural Skew Plates (Collingwood Prize for Juniors)	F. L. Ehasz	0.30
2288	The Mechanism of Energy Loss in Fluid Friction (Norman Medal)	Boris A. Bakhmeteff and William Allan	0.60
2289	Effects of Radiant Heat on Reinforced-Concrete Rigid Frames	Milan A. Johnston	0.30
2290	Correlating Flood Control and Water Supply, Los Angeles Coastal Plain	Finley B. Laverty	0.50
2291	Design Developments—Structures of the Tennessee Valley Authority: A Symposium (James Laurie Prize for Paper No. 2291A by Ross M. Riegel)	Ross M. Riegel, George P. Palo and Constant R. Marks III, Adolf A. Meyer	0.75
2292	Future of Lake Mead and Elephant Butte Reservoir	J. C. Stevens	1.10
2293	Principles of Depreciation: Final Report of the Special Committee Authorized by the Board of Direction to Analyze and Discuss the 1943 Report of the National Association of Railroad and Utilities Commissioners' Committee on Depreciation		0.60
2294	Stewardship of Professionalism Given High Priority: Address at the Annual Convention, Spokane, Washington, July 17, 1946	W. W. Horner	0.40

NEWS OF LOCAL SECTIONS

Scheduled ASCE Meetings

SPRING MEETING
Pittsburgh, Pa., April 7–9
(Board of Direction meets April 5–6)

ANNUAL CONVENTION
Seattle, Wash., July 21–23
(Board of Direction meets July 19–20)

Coming Events

Central Ohio—Meeting at the Chittenden Hotel, Columbus, March 11, at 6 p.m. William Owens, chief engineer, Department of Conservation, State of Ohio, will speak.

Colorado—Dinner meeting at the Oxford Hotel, Denver, March 8, at 6:30 p.m. Henry A. Barnes, director of traffic engineering, City and County of Denver, will speak on "Denver's Traffic Problems and Their Solutions."

Louisiana—Meeting at the St. Charles Hotel, New Orleans, March 29, at 8 p.m.

Maryland—Meeting in the Engineers Club, Baltimore, March 10, at 8 p.m. Preceded by cocktails at 6 p.m. and dinner at 7 p.m.

Metropolitan—Meeting in the Engineering Societies Building, New York, March 17, at 8. p.m.

Philadelphia—Social meeting at the Engineers' Club, March 20, at 6:30 p.m.

Sacramento—Meeting at the Elks Club every Tuesday at noon. No meetings on holidays; special meetings as announced in the "Engineerogram."

St. Louis—Luncheon meeting at the Hotel York, St. Louis, March 22, at 12:15 p.m.

Seattle—Meeting at the Engineers Club, March 24, at 7:30 p.m. Preceded by dinner at 6:15 p.m.

Tennessee Valley—Smoker-dinner meeting, Chattanooga Sub-Section at the Patten Hotel, March 9, at 5:15 p.m.

Texas—Luncheon meeting of the Dallas Branch at the Adolphus Hotel, Dallas, April 5, at 12:15 p.m.

Wisconsin—Meeting at the Engineers Society, Milwaukee, March 25, p.m. Preceded by dinner at 6 Panel discussion on "The Young Engineer and His Profession," led William J. Grede, moderator.

Recent Activities

ARIZONA

HEAVY GROWTHS OF salt cedar and tamarisk filling part of the Salt River channel constitute a serious flood hazard to Phoenix and outlying properties in case of heavy run-off on the Salt and Verde rivers, Stewart Robeson, of the Phoenix office of the U.S. Soil Conservation Service, told Section members at a recent meeting. Following a general discussion of Mr. Robeson's talk, a three-member committee was appointed to study the situation. Other speakers on the technical program were John A. Carollo, who gave an illustrated talk on the sewage treatment plant now under construction at Phoenix and outlined the city's future requirements for treatment plants; and Glen Smoot, safety engineer for the Arizona Highway Department, who showed sound moving pictures of the "limited ways" designed to accommodate heavy urban traffic. At another recent meeting, ASCE Western Representative Walter E. Jessup spoke on the advisability of making salary classifications for all grades of engineers.

CENTRAL OHIO

COLUMBUS TRAFFIC PROBLEMS and long-range plans for relieving them were described by Harry Turner, city traffic engineer, at a recent meeting of the Central Ohio Section. In outlining plans for eliminating traffic bottlenecks from downtown Columbus to the north and west, Mr. Turner also gave an insight into the parking problem in the business district. A general discussion followed his talk.

CINCINNATI

A TALK ON the metropolitan Cincinnati topographic survey—by Bernard H. Kock, senior engineer for the Cincinnati City Engineering Division—comprised the technical program at a recent meeting. This precise surveying project, carried out by a Coast and Geodetic Survey triangulation party, reestablished a first-order control network for Cincinnati and Hamilton County. A feature of the occasion was the presentation of certificates of life membership to Charles Wuest, Jr., and Edgar K. Ruth. Both reminisced briefly on early engineering projects with which they have been connected. Other recipients, who were unable to attend the meeting, are Joseph E. Root, Samuel A. Jordan, and Frank L. Raschig.

COLORADO

COMBINATIONS OF RIFFLES and vortex tubes are highly effective in solving the problem of trapping sand, gravel, and other heavy bed load common to canal diversions, Ralph L. Parshall, senior irrigation engineer for the U.S. Soil Conservation Service, told members at a recent dinner meeting. Mr. Parshall, for many years connected with the Colorado Agriculture Experiment Station at Fort Collins, stated that riffle vortex sand traps have recovered 90 to 95 percent of sand samples in laboratory tests, and that channel conditions below field installations indicate high efficiencies. These structures are not only valuable for irrigation works, but may also be used in hydraulic power and municipal water supply, he stated.

DULUTH

THE DULUTH SECTION reports that its officers for 1948 are: Joseph Veranth, president; Earl Farnam, first vice-president; Donald Jackson, second vice-president; G. W. Deibler, secretary; and Walter Hurtley, treasurer.

DAYTON

ASCE POLICIES AND aims were discussed by Executive Secretary William N. Carey at a recent meeting. Following Colonel Carey's talk, C. Russell Dole, chief engineer of power plant construction for the Dayton Power and Light Co., conducted the group on an inspection tour of the O. L. Hutchings Power Plant, now under construction. New Section officers, elected at the annual meeting, are: William E. Macy, president; Charles Stephens, first vice-president; Harvey L. Goodell, second vice-president; and C. Russell Dole, secretary-treasurer.

DISTRICT OF COLUMBIA

FORMATION OF AN Inter-American Institute for Planning and Development was advocated by Carlos de Santamaria, consulting engineer of Bogota, Colombia, and former Colombian ambassador to the United States, at the annual dinner meeting. Speaking on the subject of "The Engineer's Role in International Affairs," Mr. de Santamaria stated that the main function of such an organization would be to coordinate information on national resources, with the ultimate aim of eliminating the "scarcities" that constitute one of the present-day economic problems. Colombia will formally suggest formation of such an organization at the next meeting of the Pan-American Conference, he said. Guests of the Section for the occasion included ASCE President R. E. Dougherty, who spoke briefly; Executive Secretary William N. Carey; ASCE Vice-President Gail Hathaway; ASCE Director Roy W. Crum; and Thomas H. MacDonald, commissioner of the Public Roads Administration.

GEORGIA

ASCE PRESIDENT R. E. Dougherty, in Atlanta as principal speaker at the annual meeting of the Georgia Engineering Society, was guest of honor and speaker at a recent meeting of the Section. The capacity attendance included a large delegation from the Georgia School of Technology Student Chapter. Mr. Dougherty's informal remarks, addressed principally to the younger men, centered about his engineering experiences and the current activities of the Society.

HAWAII

RECENT EXPERIMENTS IN inducing artificial rainfall by releasing "dry ice" from airplanes were described by Luna Leopold, engineer for the Pineapple Research Institute of Hawaii, at a recent dinner meeting. New Section officers, announced at the meeting, are: Ben E. Nutter, president; Knute N. Vaksvik, vice-president; William J. Hull, secretary; and Louis H. Herschler, treasurer.

KANSAS CITY

THE HISTORY AND manufacture of prestressed concrete pipe were discussed at a recent meeting by Philip Hirsch, vice-president of the Lock Joint Pipe Co., who showed a motion picture depicting the manufacturing process at the company's Wharton, N.J., plant. Presentation of a film showing model experiments on the Tacoma Narrows Bridge failure concluded the program.

KANSAS

PRESENTATION OF CERTIFICATES of life membership to five Section members—F. W. Epps, W. A. Guild, George M. March, Hubert S. Tullock, and Frank E. Washburn—featured the Section's annual dinner meeting. The speaker of the evening was George Acree, chief draftsman in the Kansas City office of Howard, Needles, Tammen & Bergendoff, who gave an illustrated talk on the Harry S. Truman Bridge. During the business meeting, A. G. Aldridge was elected president for 1948, and Reed Morse vice-president.

KENTUCKY

ASCE DIRECTOR Daniel V. Terrell attended a joint meeting with the Kentucky Society of Professional Engineers and spoke on current ASCE activities, commenting particularly on the necessity of curtailing Society expenditures to meet the budget deficit. The technical program consisted of a talk on sewer rental rates, given by L. S. Vance, technical adviser to the Louisville, Ky., Metropolitan Sewer District.

INDIANA

INVESTIGATIONS OF THE use of aerial photography in connection with a study of Arctic soil conditions were detailed at the annual meeting of the Section by Prof. K. B. Woods, of Purdue University, who devoted the past summer to such experimentation in Alaska. During the evening a certificate of life membership in the Society was presented to Clarence L. Todd, of Richmond, Ind., by H. S Morse, also a life member. New Section officers, unanimously elected during the meeting, are: C. E. Vogelgesang, president; B. A. Poole, vice-president; and K. B. Woods, secretary-treasurer.

ILLINOIS

A TALK ON "Problems in Soft Ground Tunneling"—by Karl Terzaghi, consulting engineer and professor of the practice of civil engineering at Harvard University—constituted the technical program at a joint meeting with the Illinois Institute of Technology. There was an attendance of more than 250 to hear Dr. Terzaghi, who is an international authority on soil mechanics.

INTERMOUNTAIN

IRAN NEEDS AGRICULTURAL implements and good technical advice more than anything else, Fredrik N. Cronholm, liaison engineer for the U.S. Engineer Office at Salt Lake City, Utah, told members at their annual meeting. Mr. Cronholm, who recently was on leave of absence from the Engineer Office to make a study of land and water resources in the Near East for the Morrison-Knudsen Co., discussed possible developments in irrigation and industry in Iran. The annual election of officers resulted in choice of the following: Erwin C. Moser, president; Milton Wilson, first vice-president; and David E. Benton, second vice-president. Salt Lake City's water supply problems were discussed at another recent meeting by Lynn Thatcher, state sanitary engineer, who commented particularly on methods of sewage treatment on the watersheds. Following his talk, there was a general discussion of the possibility of designing treatment facilities so that the effluent can be used in boilers for generation of heat and power.

LOS ANGELES

CONSTRUCTION TRENDS AND probabilities were forecast at the February 11 meeting by Jack Singleton, chief engineer of the American Institute of Steel Construction. Discussing the subject, "Some Engineering Phases of Construction," Mr. Singleton stressed methods that promise economy in design and construction. His talk was supplemented by a technicolor film, "Steel—Man's Servant," presented by D. C. Storey, of the Columbia Steel Co. Members of the Section were guests of the University of Southern California Student Chapter for another meeting. Talks by Dr. Fred D. Fagg, president of the university, and Stanley Butler and Robert McClellan, both Juniors, followed dinner and inspection of the engineering laboratories on the campus.

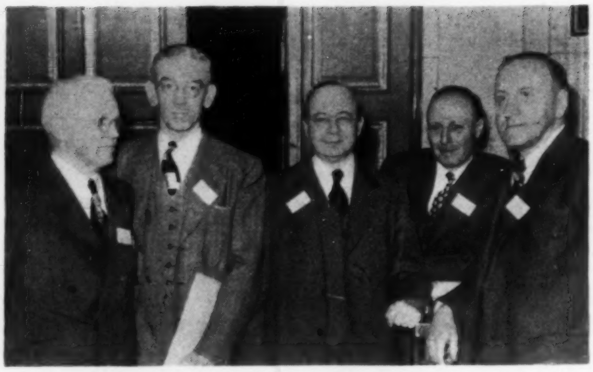
The Junior Forum of the Section met recently to discuss the advantages and disadvantages of foreign employment. Speakers were C. Martin Duke, who recently returned from Guam where he was senior testing engineer for Pacific Islands, Engineers, and Kelley McBean, of the firm of Holmes & Narver, who is just back from Okinawa.

LOUISIANA

IN A TALK on the practical application of soil mechanics to foundation problems, given at the annual meeting of the Section, John D. Watson, consulting engineer of Greensboro, N.C., discussed the rolled fill at Oak Ridge, Tenn., and described the problem of driving piles through sand. Of special interest to the group was his novel method of illustrating the fundamentals of soil mechanics by means of kitchen utensils, a screen, rubber glove, sponge, and tire pump. Donald Derickson, professor of civil engineering at Tulane University, headed a general discussion of Mr. Watson's talk.

MARYLAND

SOME OF THE problems facing the transportation system of the country were outlined at a recent dinner meeting by Lacey V. Murrow, assistant to the vice-president, Association of American Railroads, Washington, D.C. Pointing to some of the difficulties encountered in the organization and development of the Army Transportation Corps during the recent war, Mr. Murrow urged that the Corps be made a permanent part of the service in order to avoid repetition of the problem in the event of future wars. Certificates of life membership were presented t Frank J. Trelease, Richard Mather an J. A. Walls. During the business meetin S. Boyd Downey was elected presiden for 1948, and Gurney H. Dayett, vice president. Guest of honor and principa speaker at another recent meeting wa William E. Grainger, assistant genera manager of the Sparrows Point Plan of the Bethlehem Steel Co., who re counted the history of the 60-year-ol plant.



DELEGATES FROM NEW YORK STATE Joint Com mittee of Local Sections— organized in 1946 to pre sent to legislature at Al bany legislative recom mendations of ASC membership in state—mee in New York at time o Annual Meeting. Sectio delegates, left to righ are: F. J. Spry, Ithaca; E. F O'Brien, Syracuse; D. B Steinman, Metropolitan H. M. Huy, Buffalo, an H. G. Lehrbach, Rocheste

METROPOLITAN

A LECTURE EMPLOYING the use of mod els to demonstrate aerodynamics an stability of bridges was given by D. B Steinman, New York City consultant at the February 17 meeting of the Metro politan Section. An audience of mor than 300 heard Dr. Steinman, widel known bridge authority, and took par in the lengthy question-and-answer perio that followed his lecture. The speake was introduced by Harry O. Locher president of the Metropolitan Section

Design problems encountered in con struction of New York subways were dis cussed at a recent meeting of the Junio Branch by Alfred C. Maevis, project engineer for the Arthur A. Johnso Corp., who commented particularly o problems connected with the design o underpinnings and the relocation of publi utility lines.

MIAMI

OIL, GAS, ALUMINUM in water solution and other valuable mineral deposits ar present under the Florida Everglades Dr. J. F. Whitlock, geologist, told members of the Section at their Februar 5 meeting. Dr. Whitlock, who has bee exploring and studying the substrata o the Everglades area since the earl nineteen twenties, displayed samples o the mineral deposits obtained in his e plorations.

MICHIGAN

PHOTOGRAPHY AS THE rewarding hobb of a lifetime was discussed at a recen meeting by Dennis Glen Cooper, De troit science teacher, who showed u usual movies and photographs he had taken at Isle Royal. New officers for the Section, elected during the session, are: F. N. Menefee, president; George E. Hubbell, first vice-president; L. V. Garrity, second vice-president; and C. L. Palmer, secretary-treasurer.

MID-MISSOURI

Diversified talks by three student speakers, based on their engineering experiences, a review of the current Civil Engineering, and a round-table discussion of student affairs, led by ASCE Director Harry F. Thomson, comprised the program at a joint meeting of the Section at the University of Missouri Student Chapter. The student speakers were Arthur Clarkson, who spoke on "Operation of a Sanitary Fill"; Harold Kincaid, whose subject was "Effect of Thermal Coefficient of Expansion of Coarse Aggregate on Concrete"; and Roger Foster, who discussed "Time Study and Labor Costs." The review of Civil Engineering was led by Olaf Roberts. During the business session, the Section voted to allot $20 each to the Student Chapters at the University of Missouri and the Missouri School of Mines for expansion of the Chapters.

MONTANA

An analysis of a study made by the U.S. Forest Service to determine the most economical size of truck and the cheapest type of road to use in hauling approximately 8 billion board feet of timber to market each year from government forests was made by Fred E. Thieme, regional engineer for the Forest Service, at a recent meeting of the Section. The annual expenditure of hauling timber out of the national forests is about $40,000,000, he said. When completed, the study will reveal many factual data to facilitate application of cost data to specific types of roads and truck sizes, Mr. Thieme stated. Section officers for 1948 are: Fred E. Thieme, president; Edward Harper Thomas, and John S. James, vice-presidents; and Gordon K. Ebersole, secretary-treasurer.

NASHVILLE

A discussion of Nashville's traffic problems—led by Charles W. Watkins, director of planning, and W. A. Coolidge, director of public works—constituted the technical program at the Section's annual meeting. New officers, elected at the meeting, are: William H. Rowan, president, and James F. Sharp and John E. Acuff, Jr., vice-presidents.

NEW MEXICO

Speakers at the annual meeting, held jointly with the Student Chapter at the New Mexico State College of Agriculture and Mechanical Arts, included: E. W. Mars, assistant district engineer of the Texas State Highway Department, El Paso, Tex., who discussed highway development in the El Paso region; Ashley G. Classen, construction engineer of El Paso, who spoke on sewer systems in New Mexico; Harlan Hugg, Chicago engineer, whose subject was "track depressions"; and Val Ogden, Student Chapter member, who read a paper entitled "Idaho Logging Surveys." During the business meeting, the following new officers were elected: George J. Johnston, president; C. S. Howard, first vice-president; R. Elton Cook, second vice-president; and Clyde S. Conover, secretary-treasurer.

NORTHWESTERN

New developments in the stabilization of roadbeds, increased length of ties, new methods for detecting flaws in rails and other improvements in track and fixed structures were discussed at the February 2 meeting by C. E. Hise, division engineer of the Chicago, St. Paul, Minneapolis & Omaha Railway. Other speakers in the symposium on railroad construction were J. L. Robson, superintendent of motive power of the Great Northern Railway, who described the rapidly increasing use of diesel motive power, using statistics to show the economy of operation as compared with steam motive power, and F. L. Steinbright, superintendent of telegraph of the Northern Pacific Railway, who discussed modernization of signals and communications. Bernard Blum, H. S. Loeffler and Prof. J. A. Wise headed a general discussion of the symposium.

OKLAHOMA

The peacetime work of the Army Corps of Engineers was discussed at the Section's annual meeting by Col. Claude H. Chorpening, district engineer at Tulsa. Harry F. Thomson, retiring ASCE Director from District 14, talked on Society affairs, and was given a vote of thanks for his services and accomplishments during his term as Director. During the business meeting, a motion was unanimously carried to invite the Society to hold the 1949 Spring Meeting in Oklahoma City. New officers, elected during the meeting, are: Leo L. Laine, president; J. Ray Matlock, vice-president; and J. E. Lothers, secretary-treasurer.

PANAMA

A symposium on the proposed sea-level canal for Panama comprised the program at a recent meeting of the Section. C. A. Lee and C. E. Bowers, hydraulic engineers for the David Taylor Model Basin project, Washington, D.C., and J. Stuart Meyers, chief, hydraulic sub-section, the Panama Canal Special Engineering Division, discussed "Investigation of Ship Performance in Restricted Channels," the first theme of the symposium. J. E. Reeves, chief of division, the Panama Canal Special Engineering Division, and E. H. Bourquard, engineer for the Special Engineering Division, then presented the second subject in the symposium, "Design of Channel for a Sea-Level Canal."

PHILADELPHIA

Financing, construction, and operation of bridges, tunnels and terminal facilities for the Port of New York were discussed by Roger H. Gilman, assistant to the director of port development, Port of New York Authority, at the Philadelphia Section's meeting on February 10. Mr. Gilman, whose subject was "Terminal and Transportation Developments for the Port of New York," showed a sound motion picture film to illustrate his talk. Facilities of the port, he explained, include a union railroad station, truck and bus terminals, airports, grain elevator and piers.

PITTSBURGH

A panel of five members of the Pittsburgh Building Code Committee reviewed the new city building code at a joint meeting with the Pittsburgh chapter of the Pennsylvania Society of Professional Engineers. Speakers were Donald C. Peters, Raymond Fischer, Harvey Schwab, Benjamin Kaiser, and Donald McGervey. The attendance of 125 included a number of members of the American Institute of Architects.

PUERTO RICO

New officers of the Section, announced at the annual dinner meeting, are: Robert J. Auld, president; Werner Wilkins and Raoul N. Arroyo, vice-presidents, and Pedro Colon Pagan, secretary-treasurer. Wives of members were guests at the meeting.

SAN FRANCISCO

Engineering in China was discussed at a recent meeting by Ralph A. Tudor, chief engineer of the newly created division of San Francisco Bay Toll Crossings. New Section officers, announced at the meeting, are L. A. Elsener, president, and A. W. Earl and Glenn B. Woodruff, vice-presidents. J. E. Rinne continues as secretary-treasurer for another year. Principal speaker at the annual joint meeting of the member societies of the San Francisco Engineering Council was Raymond E. Davis, director of engineering materials research and professor of civil engineering at the University of California. Professor Davis, who recently returned from Europe where he served as consultant on dams for some projected hydroelectric developments in Switzerland, discussed design and construction problems, comparing European methods with our own.

ROCHESTER

Following a custom of several years' standing, the Section sponsored the weekly Rochester Engineering Society luncheon programs for a month recently. Speakers at these sessions included C. Storrs Barrows, architect; Elmer C. Lawton, division engineer, State Department of Public Works, and Floyd F. Walkley, consultant to the City Planning Commission. The two latter discussed state and city aspects of the proposed arterial highway system through Rochester. The Section's annual dinner meeting was combined with a Ladies' Night program, at which there were games and cards. New officers of the Section are: Henry G. Lehrbach, president; Robert R. Sheridan and A. Bradford Squire, vice-presidents, and Herbert P. Kopf, secretary-treasurer.

ST. LOUIS

Pointing out that the industrial and commercial upbuilding of the city of St. Louis is directly attributable to its fairs and expositions, particularly its 1904 World's Fair, Stratford Lee Morton, St. Louis life insurance executive and chairman of the 1953 World's Fair executive committee, told members of the Section at their regular luncheon meeting that a fair would be a fitting tribute to the 150th anniversary of the Louisiana Purchase five years hence. The story of St. Louis cannot be told without the history of its fairs and expositions, he said. No other activity made St. Louis better or more favorably known throughout the world than the 1904 fair, attended by 20 million people from all parts of the world, according to Mr. Morton.

SAN DIEGO

Three life membership awards in the Society were presented at the annual Ladies' Night program of the Section. Members honored were Joseph L. Burkholder, E. J. Mehren and J. J. Richey. M. J. Shelton, president of the Section, made the presentations. C. W. Capwell was chairman of the committee in charge of an entertainment and contest program in honor of the women guests.

SPOKANE

Special guest at the Section's annual meeting was ASCE Western Representative Walter E. Jessup who gave an illustrated talk on the EJC report, "The Engineering Profession in Transition." Life certificates were presented to C. R. Moore, H. E. Phelps, and V. W. Russell by W. P. Hughes, retiring president of the Section. New officers, elected unanimously, are: Harold J. McCoy, president; Allen S. Janssen and L. Vaughn Downs, first and second vice-presidents respectively, and William A. Hill, secretary-treasurer. Robert E. Tobin and J. Bryon Barber will be representatives to the Associated Engineers.

SYRACUSE

Reduction in housing costs by improved methods of construction was discussed by Eugene Clute, editor of *Pre-Fabricated Homes* at a recent joint meeting with the Syracuse Technology Club. The attendance of more than 200 heard Mr. Clute following the Section's regular business and dinner meeting.

TENNESSEE VALLEY

Urging greater industrial ownership in the South and deploring migration of "the best engineers and scientists from the South to centers where appreciation and compensation for exceptional ability are greater," Dr. Raymond B. Seymour, director of the University of Chattanooga Industrial Research Institute, addressed the Chattanooga Sub-Section at a recent dinner meeting. Dr. Seymour's subject was "The Engineer's Role in the Future of the South."

Illustrated slides showing examples of architectural concrete and form-work details were used by B. L. Chaney, regional structural engineer for the Portland Cement Association, to demonstrate a talk on "Design and Construction Details of Architectural Concrete Buildings" at a regular monthly meeting of the Knoxville Sub-Section. There was an attendance of 86.

TACOMA

New officers of the Section, installed at the annual Ladies' Night, are: John L. Stackhouse, president; Arthur Johnson, vice-president, and Fred D. Langdale, secretary-treasurer. Fred C. Dunham was presented with a certificate of life membership. Entertainment, group singing and dancing completed the evening's program.

TEXAS

Since trade centers have more money per capita and consistently more aviation activities than industrial centers regardless of size or population of the city, this factor is of prime importance in determining airport needs of a given community, C. L. Willis, Jr., chief, planning section, regional office, CAA, told members of the Fort Worth Branch at their monthly meeting. Mr. Willis spoke on "Economic Classifications as an Airport Planning Tool," illustrating the talk with graphs and charts based on actual surveys.

Methods in use in construction of the Mill Creek storm sewer tunnel in Dallas were described by A. J. McKenzie, Jr., at the February 2 luncheon meeting of the Dallas Branch. Blasting, mucking, trimming and concrete pumping operations being used on the tunnel, which is 12 ft wide and 9 ft 7 in. high inside the concrete lining, were described by Mr. McKenzie. O. G. Raynor, supervising urban engineer for the Texas State Highway Department, reported on construction work on the Central Boulevard, an expressway being constructed through the city. New officers of the Branch are: J. L. O'Hearn, president; Thomas E. Lundy, vice-president, and Milton E. Eliot, secretary-treasurer.

TOLEDO

A list of names of Toledo consulting engineers available to do work for the city has been sent the mayor, council and city manager following unanimous passage of a motion at the Section's recent meeting. Hiring of non-resident consultants for projects in the city motivated action of the Section. New officers, announced at the meeting, are S. C. McKee, president, H. P. Jones and C. E. Pettis, first and second vice-presidents, respectively. C. A. Shaler will serve a second year as secretary-treasurer. A comparison in rates, tonnage hauled and passengers served in World Wars I and II was made by R. H. Allie, publicity director of the Michigan Railroad Association, guest speaker, in a talk on "Railroads and National Prosperity."

TRI-CITY

A resolution to establish a memorial to Frank L. Flynt, to be known as the Flynt Prize, was adopted at a recent meeting of the Section, in Davenport, Iowa. The award, consisting of a scroll and a set of engineering textbooks, will be presented annually to an outstanding member of the Student Chapter at the Missouri School of Mines, Mr. Flynt's alma mater. Administration of the award will be handled through the school. C. B. Kelly, power pool manager of the United Light and Railways Service Co., and two of his associates discussed developments of interconnections of electric service companies, commenting particularly on the benefits to the areas to be served by his company.

WEST VIRGINIA

Postwar America is paying monopoly prices for construction labor, Carl B. Jansen, chairman of the labor relations committee of the Associated General Contractors of America, Pittsburgh, told members of the Section at their regular dinner meeting. In a talk entitled "Construction Outlook as Viewed in Light of Present Conditions," Mr. Jansen pointed out that monopoly prices are "the aftermath of the policies set up in the 1930's when emphasis was on higher employment ratios rather than higher production." Life membership certificates were presented to Owen M. Jones, I. Oesterblom, G. H. Bayles, and C. J. Colgan.

WISCONSIN

ENGINEERS, AS TECHNICAL men, must accept some responsibility in solving the problem of providing shelter for the population at a price it can afford to pay, Richard W. E. Perrin, executive director of the Milwaukee Housing Authority, told the Section at a regular meeting recently. Despite the fact that 200 housing units were completed in the metropolitan area of Milwaukee in 1947, there is still desperate need of 14,000 family units. Officers of the Section for the coming year are: James G. Woodburn, president; O. Neil Olson and Fred M. Sloane, first and second vice-presidents, and Charles W. Yoder, secretary-treasurer.

STUDENT CHAPTER *Notes*

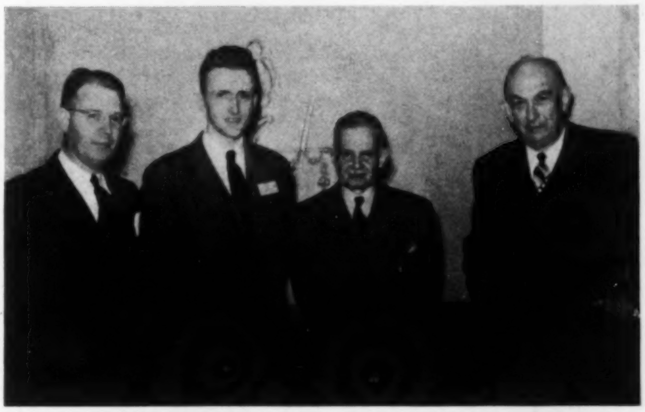
TEXAS COLLEGE OF MINES

TWENTY-TWO STUDENTS at the College of Mines, El Paso, are members of a newly organized branch of the University of Texas Student Chapter of ASCE. Membership in the group is open to all civil engineering students with credit of 30 or more semester hours. James R. Myers is chairman of the College of Mines unit; George Kistenmacher, vice-chairman; Arthur Alarcon, secretary, and Robert Bustamente, treasurer. R. L. Lowry, M. ASCE, and T. S. Curry, Jun. ASCE, were guests at the College of Mines inaugural meeting, and Mr. Curry is to serve as Contact Member between the Mines group and the Texas Section.

WASHINGTON UNIVERSITY

Inspection of the site of the Chain of Rocks canal and bridge project, now under construction north of East St. Louis, constituted a recent meeting. The canal will cross U.S. Highway 66, resulting in rerouting of the highway over a new bridge consisting of a 465-ft through truss and 16 smaller spans. A unique construction feature was the lowering of the water table from 10 to 50 ft below the surface by means of pumps and numerous well points, making it possible to drive the concrete foundation piles in open-pit excavation. Arrangements for the inspection trip were made by the St. Louis District Office of the Corps of Engineers.

WASHINGTON UNIVERSITY STUDENT CHAPTER members visit Chain of Rocks project, accompanied by Prof. E. O. Sweetser, Faculty Adviser (holding hat, right) and N. W. Wasserman, supervisor from U.S. Engineer Office (holding hat, left)



AMONG SPEAKERS at Student Conference, held during Annual Meeting, were (left to right): G. Brooks Earnest, chairman of ASCE Committee on Student Chapters; Robert Lockwood, chairman of Metropolitan Conference of Student Chapters; L. F. Grant, president of Engineering Institute of Canada, and ASCE President R. E. Dougherty.

MORE THAN 150 new members for Purdue University Student Chapter were obtained in recent intensive membership drive, launched by talks on advantages of Student Chapter membership and of early affiliation with ASCE. Part of Student Chapter group is pictured here. Chapter officers are: Leon Abele, president; Robert Esch, vice-president; Philip Neff, secretary; and James Zervas, treasurer.

NEWS BRIEFS

Truman, Highway Experts Urge Continued Federal Road Aid

With President Truman recommending to Congress extension of federal highway aid, now scheduled to expire in June 1949, testimony of two men well known to the Society was heard by the subcommittee on public works recently. A recommendation that national highway policy be based on a continuing federal aid program of substantial size was made by Dwight W. Winkelman, president of the Associated General Contractors of America, Inc., before the House of Representatives public works subcommittee on roads. Charles M. Upham, M. ASCE, engineer-director, American Road Builders' Association, testifying before the same committee, said that "our highways are not efficiently meeting our highway demands and highway users are being severely penalized by lack of highway facilities.

"Highway transportation is a real factor in our production program and has become such an integral factor in our national economy that a condition which produces any but the most economical transportation has a direct bearing on every individual in the nation."

A program of continuous improvement must be carried on to provide facilities for a rapidly increasing volume of traffic, Mr. Upham told the subcommittee. This is the only way, he said, that obsolescence can be overcome and maintenance costs kept at a reasonable figure. Since depreciation and obsolescence are constant, the program of replacement and modernization must be constant, he said, and to do this the highway construction program must be kept at an adequate level.

President Truman, in a recent message to Congress, urged extension of the federal aid program for two more years beyond the expiration date, with the government spending $500,000,000 yearly. Mr. Truman urged the Congress to take action at its present session, so state legislatures, most of which will convene early next year, may know how much federal aid they can count upon.

Speaking as the representative of 4,500 leading general contractors in the country, about half of whom are highway builders, Mr. Winkelman pointed out that as a result of a considerable investment in time and money since the war, organizations and equipment have been assembled that can now give high volume construction, with cheaper costs resulting from continuous production.

"It would be short-sighted," he said, "to provide for anything less than a long-term national program of substantial size. Well-equipped highway contractors represent an asset to each highway department that should be used to the fullest practicable extent."

1947 Materials Production May Exceed All-Time Peak

The year 1947 probably will stand out as one of record production of construction materials when final figures for the entire year are tabulated. Extension of eleven months' data indicates that the U.S. Department of Commerce Composite Index of Production for Selected Construction Materials for 1947 will exceed slightly the previous all-time peak level of production reached in 1925, and will be at least 5 per cent above the high figure reached in 1941.

The anticipated new record likely to be set by production of construction materials as a whole will result from the fact that a number of important individual materials have also reached record volumes of output. Experience of the first eleven months of last year indicates that, with average normal output in the remaining month of the year, new all-time records in production will be established for cement, cast iron soil pipe, asphalt prepared roofing, siding and felts, and warm air furnaces. Wire nails and clay sewer pipe were produced at near record levels in the first eleven months, and production of these items may also reach new peaks when final returns are in.

Eighteen of the 20 materials included in the Index recorded higher production levels in the first eleven months of last year than in the corresponding period of the previous year. Increases range from 1.8 percent in total lumber output to 104 percent in hardwood flooring.

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Construction Activity in 1947 Tops That of 1946

New construction activity again increased in 1947 over the previous year, continuing the advance started in the fall of 1945 following the war's end and subsequent removal of nearly all wartime controls, according to the U.S. Department of Commerce Industry Report for January 1948. In 1946 and 1947, the report indicates, the period of active building was prolonged into the late fall, making October the peak month and causing unseasonably high volumes in November and December.

While the 1946 trend was due largely to sustained activity in industrial and other private nonresidential construction, extension of the building season last year was caused chiefly by private residential building. This category of construction accounted for a larger percentage of total in 1947 than in 1946. If publicly financed residential building is included, construction of dwelling units is responsible for almost 40 percent of new construction volume in 1947, as against 36 percent in 1946, although public residential activity was less than half as great an influence in the latter year.

Total value of construction in 1947 is estimated at almost $13 billion, or within one-third billion dollars of the peak attained in 1942. Allowing for changes in construction costs during the intervening years converted to 1939 prices, physical volume in 1947 will be about 10 percent higher than in 1946, but only about five-eighths of the 1942 level which was approximately equal in physical volume to the high years of the 1920's (1925–1928).

The estimate of a 10 percent increase in physical volume between 1946 and 1947 may understate the extent of the rise which actually occurred because some of the indexes used fail to take account of the effect of increased efficiency of building operations in 1947, due to greater availability of materials, fewer interruptions to the flow of work, and improved output by experienced workers.

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State Highway Department Offers 180 Top Positions

Marking an all-time high in the level of positions and entrance salaries offered, 180 newly created positions in the State Highway Department of New Jersey are now open, with competitive examinations scheduled for this month. Placement of the largest number of new technical personnel in recent years is expected by the state's Civil Service Commission.

Salaries for principal highway engineer range from $4,200 to $5,100 annually, and for senior engineer from $3,600 to $4,500. Candidates for vacancies in these positions must have a college education or its equivalent, plus relevant experience. College-trained men in the field of engineering may also qualify for positions of assistant engineer, bridge inspector, junior engineer, laboratory technician, among others.

Candidates with the equivalent of a high school education plus requisite technical experience may compete through examination for positions as highway inspectors, engineering aides, bridge detailers, laboratory assistants and others. Examinations are open to qualified citizens of the United States, with preference in appointment given to New Jersey residents. Veteran's preference is extended to candidates for open-competitive and promotional examinations, with state employment offering additional advantages connected with a career service, where security of position is assured. Requests for application blanks may be directed to the Engineering Section of the New Jersey Civil Service Commission, State House, Trenton, N.J.

Construction Industry Is Top Aluminum Consumer

NUMBER-ONE CONSUMER of aluminum in 1947 for the second consecutive year was the building construction industry, a report made public by the Aluminum Company of America indicates. There was an overall increase of more than 20 percent above 1946 during 1947, in which estimated shipments of semifinished aluminum products approximated 1,850,000,000 lb, compared with 1,530,000,000 lb for 1946, the top previous peacetime year. The 1947 total is based on preliminary figures published by the U.S. Department of Commerce for the first ten months of that year.

Most attractive market for aluminum at present, as indicated in the aluminum company report, is the building industry. During the war hundreds of thousands of rural and industrial buildings deteriorated because of shortages of labor and repair materials.

Use of aluminum for such commercial vehicles as truck, bus and trailer units greatly increased during 1947. More lightweight buses were introduced to the public than ever before. Not only is aluminum used for body construction in buses but for bumpers, heaters, seats, window frames, lighting fixtures, stanchions, door fixtures and other parts. Bus and truck engines also employ large quantities of aluminum in pistons, cylinder heads, valve chamber covers and camshaft gears.

Railroads constitute another growing market for aluminum, two decades of practical application on a constantly increasing scale having demonstrated the merits of aluminum to railroad officials who are today specifying its use more than ever before, the report states. Aluminum continues important in the structural field, both for movable and stationary structures. It has also been used for a number of heavy structural applications, such as dragline booms, power shovel dippers, mine cars and cases, and bridge floor systems. Large potential applications in the structural field appear to be switchyard structures for electric utilities, railroad roundhouses, water towers and tanks, flood control equipment and bridges.

The material first was used for bridge construction in 1933, when an aluminum floor replaced a steel and wood floor in Pittsburgh. During the war the metal was employed extensively for the Army's M-4 pontoon bridge program. (See pp. 441–442, Sept. 1945, CIVIL ENGINEERING.) The first all-aluminum bridge span in history was installed in 1946 on the Grasse River bridge of the Massena Terminal Railroad at Massena, N.Y. (See pp. 527–531, Dec. 1946, CIVIL ENGINEERING.) The aluminum span, one of seven in this bridge, is 100 ft long and weighs only 53,000 lb, as compared with 128,000 lb for similar steel spans.

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Sanitary Project Completed by FWA in Hampton Roads Area

COMPLETION OF THE FWA portion of a $16,000,000 sanitary sewer project in the Hampton Roads area in Virginia is announced by Maj. Gen. Philip B. Fleming, M. ASCE, FWA administrator. The project, which includes 72 miles of sewer lines and force mains, 17 pumping stations and a treatment plant, constitutes one of the largest public works of this type undertaken by the federal agency during the war. About $7,250,000 in Lanham Act funds was spent on the project. The government will receive $2,750,000 in revenues.

Begun as a war public works project to relieve problems of sewage pollution resulting from large population increases in Norfolk, Portsmouth, Newport News, and surrounding areas, total cost of the project thus far has been about $8,500,000, with additional expenditures of some $6,000,000 by the Hampton Roads Sanitation District Commission at Norfolk and $1,500,000 by the city of Portsmouth to be spent for completion of the master plan, scheduled for early summer.

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"Engineers' Week" Honors Profession in Oklahoma

RECOGNITION OF THE vital part played in civilization by the engineering profession, "without whose technique and skills nothing, save natural resources, could have come into being," was fittingly bestowed by an entire week of observance in January throughout the State of Oklahoma by proclamation of its governor, the Hon. Roy J. Turner. Only once before—in New Jersey a few years ago—has such a state-wide tribute been paid the profession.

Influence of engineering on the welfare and progress of the country as a whole, on municipal, county and federal projects, oil, transportation, manufacturing, communication, utilities and education, was graphically demonstrated through window displays in stores throughout the state and in newspaper and magazine photographs and write-ups. Speakers on the radio and and at club and organization meetings of every type built word pictures of the importance of the profession and the men who make it. Members of the Engineers Club of Tulsa sponsored a moderator-panel broadcast embracing organization and functions of various specialized engineering societies in that community.

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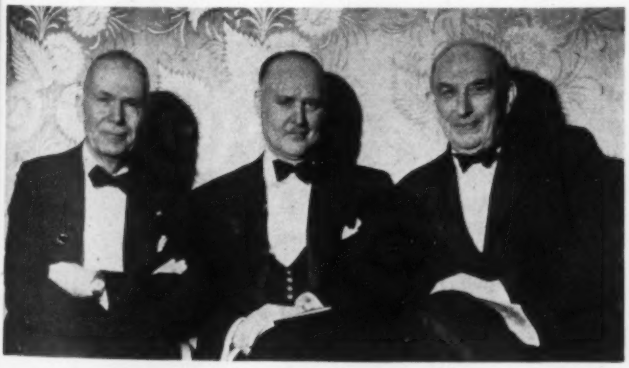
Bids Sought for Largest Contract at Soo Power Project

INVITATIONS TO BID on the largest and last major contract on the $7,000,000 hydroelectric power plant project at Sault Ste. Marie, Mich., were issued recently by the Corps of Engineers through the Detroit district office. Included in the contract for the work at St. Marys Falls will be the power house, concrete spillways, excavation in the upper headrace, excavation of the tailrace, and the removal of cofferdams. It will provide additional power for Sault Ste. Marie and adjacent territory, and continue to provide power for operation of the federal-controlled locks.

ASCE Members on Program of Moles Award Dinner

FOUR ASCE MEMBERS—President R. E. Dougherty, Charles B. Spencer, and Carl L. Swenson, of New York, and Gen. Brehon B. Somervell, of Pittsburgh—were prominent on the program of The Moles' dinner in the Roosevelt Hotel, New York, February 4, at which the organization's annual awards "for outstanding contributions to construction progress" were presented. As president of The Moles, New York society of tunnel and heavy construction men, Mr. Spencer served as master of ceremonies, and Mr. Swenson, chairman of the Award Committee, directed the presentation ceremony.

President Dougherty made the speech introducing William A. Durkin, president of the Walsh Construction Co., who received the member award for "his extraordinary leadership, diligence and distinguished accomplishment notably in the fields of railroad, tunnel and drydock construction." General Somervell, president of the Koppers Co., introduced Lt. Gen. Raymond A. Wheeler, Army Chief of Engineers, winner of the non-member award, cited as "engineer, soldier and diplomat, in recognition of his courage, skill and genius notably in the fields of rivers, harbors and flood control and military construction."


READY TO INTRODUCE WINNERS OF MOLES' annual awards for outstanding construction achievement at Roosevelt Hotel, February 4, are these three ASCE members (left to right): Gen. Brehon B. Somervell, 1941 winner of Moles Award, who introduced Lt. Gen. Raymond A. Wheeler, non-member recipient; Carl L. Swenson, chairman of Award Committee, who directed presentation ceremony; and President R. E. Dougherty, who made speech introducing winner of member award, William A. Durkin.

Civil Service Examinations for Engineers Are Announced

PROFESSIONAL POSITIONS in grades P-6 to P-8 in all branches of engineering are open in several departments and agencies in Washington, D.C., and its vicinity. A majority of the positions are in the Department of the Army, the Department of the Navy, the Department of the Interior, the Department of Commerce, the Department of Agriculture, and the Federal Works Agency. Salaries range from $7,102 to $9,975 a year. Applications should be submitted to the U.S. Civil Service Commission, Washington 25, D.C.

No written examination is required, but a preliminary review will be made of the training and experience of each applicant. Applicants who do not meet the prescribed requirements will be notified to that effect, and their applications will be returned. Applications of those who appear to meet the examination requirements will be retained. As vacancies occur, the qualifications of the latter group will be evaluated in relation to specific positions to be filled, and supplemental information may be requested from applicants.

Positions now available include such work as:

1. The preparation of specifications for structures, machines, equipment, ships, public works, power plants, and communication or transportation facilities, involving applications of theoretical and applied mechanics and a knowledge of the strength and properties of materials.
2. Original research in one or more branches of engineering.
3. Engineering phases of mapping, such as land and hydrographic surveys, and the application of engineering techniques to map production.
4. Evaluation, investigation, or survey of engineering projects, structures, devices, or services.

Basic requirements are successful completion of a standard professional engineering curriculum in a recognized college or university, or four years of successful and progressive technical engineering experience of a nature that will enable applicants to perform successfully at the professional level. In addition, applicants for all grades must have had four years of broad professional engineering experience, with at least one year in important and responsible work.

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Aerial Mapping Projects Aid Pennsylvania Highway Work

TWO AERIAL SURVEYING projects in Pennsylvania designed to expedite travel and modernize highway routes are nearing completion with notable savings in time and cost reported through use of photogrammetry.

With 75 percent reduction in time consumed for the aerial as compared with ground mapping, final delivery is scheduled for mid-March of maps for the Pennsylvania Turnpike's eastern extension. The Harrisburg, Pa., engineering firm of Gannett, Fleming, Corddry and Carpenter has been commissioned to design the highway extension with Aero Service Corp., of Philadelphia, in charge of the aerial mapping.

The mapping project will be completed in five months at a cost of $86,000, substantially lower than the cost of a comparable ground study. The route map covering a strip 1 mile wide and 141 miles long, extending from a point near Carlisle to a point near Paoli, will show 5-ft contours and will have a scale of 1 in. equal to 200 ft.

Another Harrisburg engineering firm, Modjeski & Masters, has been engaged by the Pennsylvania State Highway Department to construct a modern expressway to interconnect all important highway routes centering in that city. Part of the survey, covering a strip 20 miles long by 2,000 ft wide, will be done by the photogrammetric division of Lockwood, Kessler & Bartlett, Inc., Engineers, Brooklyn, N.Y. The map will have a scale of 1 in. equal to 100 ft and will show 2-ft contours.

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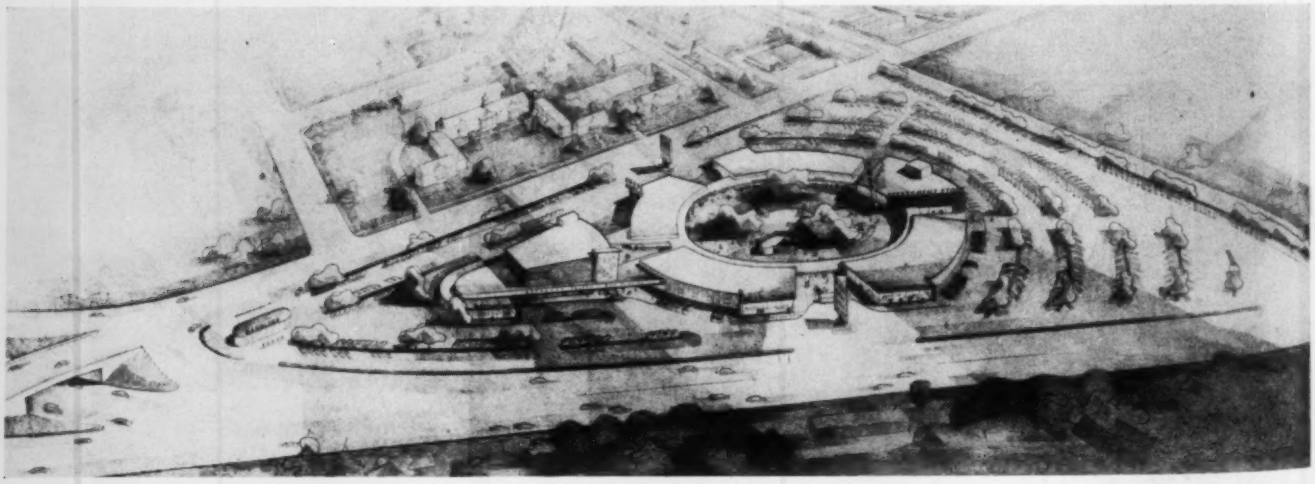
Engineers to Participate in Vocational Aid Symposium

ENGINEERING WILL BE one of the five basic professions analyzed by a group of 100 invited specialists in education at the Inter-Professions Conference on Education for Professional Responsibility, to be held April 12 to 14 at Buck Hill Falls, Pa. Sponsored by the Carnegie Corporation of New York, the conference will be the first meeting of its kind.

Harry S. Rogers, M. ASCE, president of the Polytechnic Institute of Brooklyn, will speak as representative of the profession of engineering at the opening session, at which representatives in the other four major fields—medicine, law, theology and business—also will make addresses.

Particular emphasis will be placed at the conference upon the need for professional education to aid the student to acquire knowledge, skills, interests, a sense of responsibility and ways of thought and traits of character that will enable him to meet present-day and future demands of professional practice, serve society well as a citizen, and continue to learn and grow as a professional man, a citizen and a person.

Circular Arrangement of Buildings Features Suburban Shopping Center



NEW $4,500,000 SHOPPING CENTER FOR Maywood, N.J., including two-story department store, theater, restaurant, supermarket, bowling alleys, and total of 40 shops, will utilize circular arrangement of buildings to give all structures in area central location. Plans for center, which will occupy 14.5 acres along U.S. Route 17 and Essex Street in heart of large residential community, are by Kelly & Gruzen, New York, engineers and architects, and builder is Joseph J. Brunetti. Main entrances of stores will be arranged about circular court, where customers can shop with minimum of effort and without danger from traffic. Automobiles will be excluded, but plans provide for parking facilities around perimeter of center, with accommodations for 800 cars.

Bureau of Reclamation Announces Western Construction Projects

UNDER THE HEAD OF "Bid Calls Expected This Month," the Bureau of Reclamation's *Advance Construction Bulletin* for February lists work about to go forward on several large Western construction projects. Although the bulletin states that all information published is subject to revision, the data given will provide an indication of the nature, size, and location of proposed reclamation projects.

CONCRETE DAM AND POWER PLANT

Hungry Horse Project, Montana

Location: About 25 miles northeast of Kalispell, Mont.

Work: Construction of Hungry Horse arch-gravity, concrete dam, approximately 520 ft high and 2,100 ft long, and power plant of reinforced concrete construction housing four 75,000-kw generators.

Excavation (all classes)	1,265,000 cu yd
Concrete (all classes)	3,000,000 cu yd

Time Allowed for Completion: 2,000 days.

CANAL

Missouri Basin Project, Nebraska

Location: Near Cambridge, Nebr.

Work: Construction of earthwork and structures for approximately 13 miles of Cambridge Canal.

Excavation	1,100,000 cu yd
Concrete	6,000 cu yd
Reinforcement steel	748,000 lb
Concrete pipe	4,000 lin ft

Time Allowed for Completion: 450 days.

LATERALS AND STRUCTURES

Riverton Project, Wyoming

Location: Vicinity of Pavillion, Wyo.

Work: Construction of lateral system on Wyoming Canal extension from Station 883 to Station 1606.

Excavation	250,000 cu yd
Concrete	1,550 cu yd
Concrete pipe	2,000 ft
Reinforced steel	150,000 lb

Time Allowed for Completion: 420 days.

CONCRETE PIPE LATERALS

Coachella Division, All-American Canal, California

Location: Near Mecca, Calif.

Work: Construction of about $6^1/_2$ miles of 78- and 84-in. high-pressure concrete pipe laterals.

Exctavaion	180,000 cu yd
Concrete	1,050 cu yd
Precast concrete pipe	37,600 lin ft
Gates and hoists	35,000 lb

Time Allowed for Completion: 300 days.

Rate Increase of One-Third Is Urged for Water Systems

A RATE INCREASE averaging approximately 30 percent must be had by the water works systems of the country if they are to progress and improve their standards of service to the same extent as during the past 20 years, according to Louis R. Howson, M. ASCE, of the firm of Alvord, Burdick & Howson, Engineers, Chicago.

Speaking on "Do Water Works Need Increased Rates?" before the New York Section of the American Water Works Association, of whose committee on water works practice he is chairman, Mr. Howson emphasized that it "is just as much the obligation of a water utility to adequately provide money needed for its orderly expansion as it is to set up a depreciation reserve to guarantee its continuity of service."

During the past 20 years new investment in water works properties has grown approximately two and a half times as fast as the population, which indicates that demands created by rising standards for water service are of greater importance in affecting capital expenditures than is growth in population, Mr. Howson said.

"Present water rates," he pointed out, "will not support the property in the same manner that it has been supported in the past. Water works have joined the 'profitless prosperity' to which many industries have been subjected for some time. A worn-out boiler or pump cannot be replaced, or needed betterments provided at prewar costs any more than can meat, sugar or bread."

Water, he said, is generally selling at the same price in 1948 as it sold before the war, while coal, wheat, and other basic commodities have increased in cost from 50 to 100 percent or more.

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Salary Practices of State Highway Departments Studied

TO ELIMINATE DELAYS in highway construction programs, caused by shortages of engineering personnel, the Highway Research Board Committee on Highway Organization and Administration, in conjunction with a special committee of the American Association of State Highway Officials, has made a survey of the salary situation in the various state highway departments.

Findings of the Highway Research Board committee, headed by S. C. Hadden, M. ASCE, indicate that as of July 1, 1947, there were approximately 9,800 unfilled engineering positions (4,400 professional, 5,400 sub-professional) in the 48 state highway departments; that salary increases during the past few years have been "haphazard and piecemeal, with little or no study of the real problem and situation existing"; and that highway administrators should take the lead in vigorous and scientific attack on the problems of organization, including salaries, employment conditions, recruiting procedures, and performance standards, as they apply to technical problems.

Complete results of the survey are now available in Bulletin No. 9 of the Highway Research Board, entitled *Salary and Wage Practices of State Highway Departments.* Copies may be obtained from the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

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Purdue University Road School Attended by Highway Experts

PROMPT AND EFFECTIVE solution of problems threatening highway investments was urged by a score of speakers at the 34th annual Road School, recently held at Purdue University under direction of the school of civil engineering and engineering mechanics together with the technical extension division. Speakers also emphasized the need for meeting traffic demands to be made upon roads in the coming months. R. B. Wiley, ASCE Vice-President and head of the school of civil engineering at Purdue, opened the general session which launched the four-day program. Sessions were arranged to assist such specialized groups as city engineers, county surveyors, traffic engineers, street commissioners, county road supervisors and commissioners, state highway maintenance, road construction, bridge construction and roadside improvement men to discuss their problems in group meetings and hear authorities suggest solutions.

Among ASCE members participating as speakers and presiding officials were Samuel C. Hadden, Don E. Bloodgood, W. W. Sanders, F. H. Green, W. W. Hadley, John H. Matthews, J. T. Hallett, C. M. Noble, John W. Wheeler and Norman W. Nester.

◆

75th Anniversary Volume Issued by Mining Engineers

TO CELEBRATE THE 75th anniversary of its founding—in May 1871, at Wilkes-Barre, Pa., the American Institute of Mining and Metallurgical Engineers has issued an 800-page volume, entitled *Seventy-Five Years of Progress in the Mineral Industry.* Edited by A. B. Parsons, the volume includes a series of articles dealing with the major branches of the mineral industry; a history of the Institute itself, and the proceedings of the World Conference on Mineral Resources, held in New York in March 1947 in conjunction with the 75th anniversary celebration of the AIME.

The volume may be obtained from the American Institute of Mining and Metallurgical Engineers, 29 West 39th Street, New York 18, N.Y., at a cost of $4 to members of the AIME and $6 to non-members.

◆

Group Travel Set for World Soil Mechanics Conference

GROUP TRAVEL ARRANGEMENTS for those attending the Second International Conference on Soil Mechanics and Foundation Engineering are being made through Lissone-Lindeman, 509 Fifth Avenue, New York, according to T. K. Huizinga, secretary of the conference, scheduled for Rotterdam, June 21 to 29. Approximate round-trip cost will be $450 per person. Air travel can be arranged from New York to Rotterdam at a cost of about $650 round trip.

Following the conference, group travel will be arranged to laboratories and construction jobs in continental Europe and England between June 30 and July 9. A 6 percent discount on travel costs will be given to groups of 16 or more persons traveling by air or steamer. Arrangements for return later than July 9 may be made. Applications for group travel and for membership in the conference may be obtained from Prof. Howard P. Hall, Technological Institute, Northwestern University, Evanston, Ill., secretary of the U.S. committee.

◆

Iowa County Engineers Open Annual Conference Series

SEVERAL MEMBERS OF the Society participated in the first annual County Engineers Conference, recently held at Iowa State College under joint sponsorship of the Iowa County Engineers Association, the civil engineering department and engineering extension service of the college, and the Iowa Highway Commission.

L. O. Stewart, secretary of the Iowa Section of the Society and head of the college's civil engineering department, presided at several meetings during the three-day conference. Among other ASCE members taking part in the technical program were Fred White, chief engineer, Iowa Highway Commission; C. C. Coykendall, engineer, Iowa State Highway Commission; A. E. Stoddard, assistant engineer, materials and tests, State Highway Commission; R. E. Robertson, county engineer; and M. G. Spangler, R. A. Moyer, Robley Winfrey and J. P. McKean, of the college engineering faculty.

◆

New Study Appraises Role of Norwegian Engineer in America

THE ROLE OF the Norwegian immigrant in American engineering and technological development is covered in *Saga in Steel and Concrete*, a 500-page illustrated study sponsored by the Norwegian-American Historical Association. Author of the volume is Kenneth Bjork, professor of history at St. Olaf College.

The long list of engineers and architects, born in Norway and educated in European schools, who have been instrumental in the building of American bridges, tunnels and skyscrapers and in the development of industrial techniques that have shaped American life, includes many ASCE members—Gustav Lindenthal, Hon. M., Aksel Andersen, Ole Singstad, Soren A. Thoresen, Tollef B. Mønniche, Gunvald Aus, Nicolay Founger, Inge Lyse, Soren Kielland, T. D. B. Grøner, and Hans Helland, to mention a few.

Saga in Steel and Concrete sells for $4, and inquiries should be addressed to the Norwegian-American Historical Association, Northfield, Minn.

Meetings and Conferences

American Society of Tool Engineers. Opportunity to visit numerous plants in the Cleveland area will be offered those attending the 16th annual meeting of the American Society of Tool Engineers and the Tool Engineers Industrial Exposition, to be held in the Cleveland Public Auditorium, March 15–19. The annual banquet and national annual membership meeting of the society will take place at the Hotel Carter, Cleveland, on March 18.

Chicago Technical Conference. "A Progress Report to the Nation" is the theme of the Chicago Technical Conference, to be held in conjunction with the annual Chicago Production Show, at the Stevens Hotel, Chicago, March 22–24. The ASCE will be among the 51 engineering, scientific and technological societies participating. Inquiries should be addressed to Paul A. Jenkins, Chicago Technical Societies Council, 53 West Jackson Boulevard, Chicago 4, Ill.

Midwest Power Conference. The three-day power conference, sponsored annually by the Illinois Institute of Technology, will be held at the Sheraton Hotel, Chicago, April 7–9. Participating groups include numerous state and local branches of national engineering societies, including the Illinois Section of the Society, and nine Mid-Western colleges and universities.

National Association of Corrosion Engineers. A technical program devoted to problems of corrosion and displays of the latest materials, methods and equipment for combating corrosion will feature the 1948 Conference and Exhibition of the National Association of Corrosion Engineers, to be held at the Hotel Jefferson, St. Louis, Mo., April 5–8.

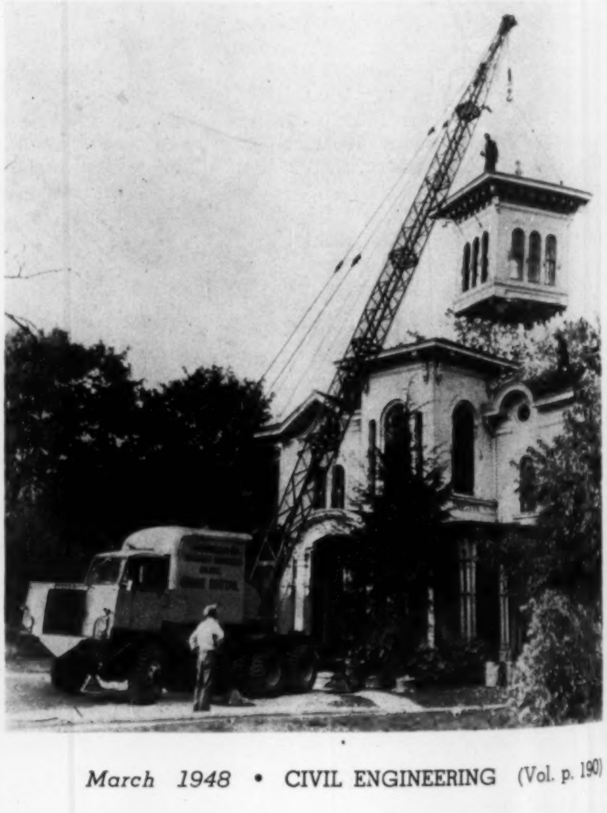
◆

Civil Engineers Rank High on Professional Examinations

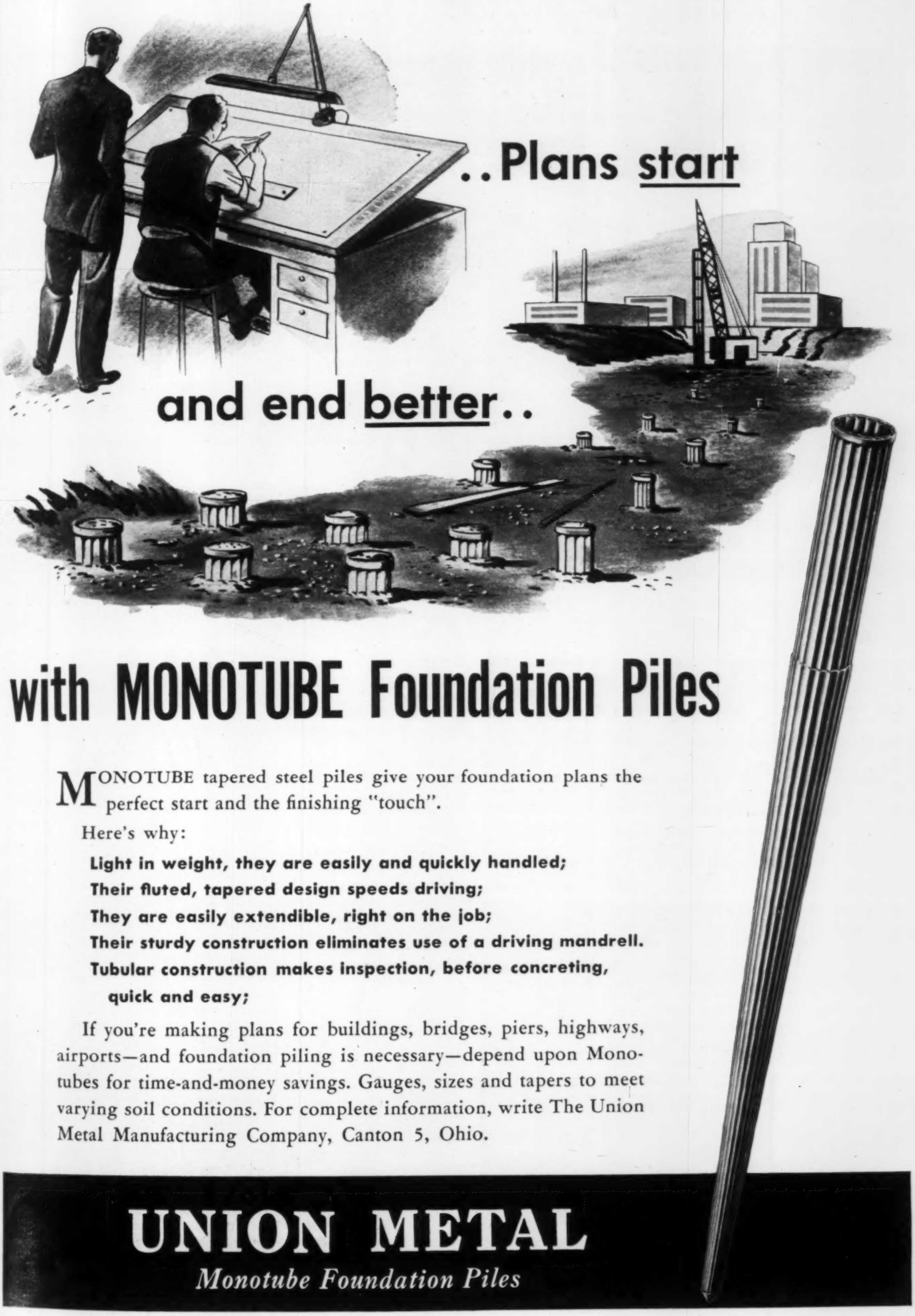
GRADUATES IN CIVIL engineering constituted the highest percentage of candidates for Professional Engineers in examinations in New York State during the period from June 1942, through June 1946, according to figures disclosed by Dr. D. B. Steinman, M. ASCE, New York chairman of the Registration by Endorsement Committee. The same authority indicates that civil engineers made up the highest percentage of those seeking engineers-in-training recognition during the first seven preliminary examinations, June 1943 through June 1946.

A total of 42 percent were civil engineering graduates in the Professional Engineers examinations, compared with 29 percent for the next highest group, while in the engineers-in-training unit 41 percent were civil engineering graduates, compared with 35 percent in the next highest group. Exceeded in percentage only by mechanical engineering graduates who stood at 71 percent, civil engineering graduates in the professional engineers' group passed 65 percent. On the engineers-in-training examinations, civil engineers passed 64 percent, second highest to the mechanical engineers' passing ratio of 83 percent. A total of 283 civil engineers passed the professional engineers examinations, while 95 passed the engineers-in-training tests.

Power Crane Accomplishes Unique Job



TYPICAL OF extraordinary uses to which power cranes are sometimes put is removal of century-old four-ton cupola from headquarters building of Bridgeport, Conn., Art League during recent renovation program. Technique for removing, lifting, and lowering 1,000-cu ft cupola baffled dismantling crew until 20-ton Lorain Moto-Crane was called into action.



with MONOTUBE Foundation Piles

MONOTUBE tapered steel piles give your foundation plans the perfect start and the finishing "touch".

Here's why:

Light in weight, they are easily and quickly handled;
Their fluted, tapered design speeds driving;
They are easily extendible, right on the job;
Their sturdy construction eliminates use of a driving mandrell.
Tubular construction makes inspection, before concreting, quick and easy;

If you're making plans for buildings, bridges, piers, highways, airports—and foundation piling is necessary—depend upon Monotubes for time-and-money savings. Gauges, sizes and tapers to meet varying soil conditions. For complete information, write The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles

Wool Gatherings
by WOOLLEY

THE 200-IN. MIRROR for the mighty telescope at Mt. Palomar is finally pronounced finished. Grinding and polishing began in 1938 was stopped in wartime and resumed at the end of 1945 The disk is a perfect paraboloid within two millionths of an inch.

LOS ANGELES is planning three 37,500-kw generators for use as run-of-river plants at locations several miles apart. They will operate unattended.

TO GET the new 108,000-kw Grand Coulee generator back on the line in a hurry, six tons of bearings were sent air express from Pittsburgh at a cost of $75,000.

TRANSPORT IS one of the big headaches for oil producers. Pipeline and tank-car facilities are inadequate for full use of all facilities.

ONLY ONE out of 102 college graduates attains a Ph D. in science.

IT TAKES 1,000 fifth grade pupils to make 72 college graduates.

OVER 13,000 cities, towns and services are served by water systems in the United States.

THE INSTALLED CAPACITY of generating plants in utility service October 31, 1947, totaled more than 51,600,000 kw.

ALUMINUM ROOFING NAILS are packaged in 50-lb kegs containing 50 percent more nails than 100-lb kegs of iron nails.

THE CARAT, used for centuries to express the weight of gems, is now standardized at $^2/_5$ of a gram.

IN NORMAL TIMES more than one-third of all the tonnage handled by the railroads of the United States is coal.

IN EXTREMELY COLD WEATHER some railroads reduce the number of cars in a freight train in order to keep the train moving on schedule. A 10 percent reduction is made when the mercury hits 15 deg and as much as 30 percent is made at temperatures of zero and below.

FROM 1929 to 1946, 63.9 percent of the entire national income went for wages and salaries.

17 PERCENT of London's water supply is from underground sources. Over the years this draft together with that by industry has lowered the water level in wells that were overflowing 100 years ago to about 250 ft below the ground level.

THE EGYPTIANS had irrigation systems 5,000 years ago.

N. G. NEARE'S Column

R. Robinson Rowe, M. ASCE

"PARKING METERS!" The Professor smiled as these magic words drew instant attention at the Engineers Club. "The most cussed and discussed topic of the age," he explained. "We revile them as unconstitutional nuisances when we can't find a penny, but the penny buys 12 min anywhere, anytime, regardless of inflation. They promoted the Traffic Engineer from an impoverished wart-and-stripe inspector to an esteemed municipal *finangineer*, like Nick Ulnercer here in Esseyeville. Has anyone figured his gate the day his pennies came out even in rolls?"

"That must have been a holiday," said Joe Kerr. "Merriman, Urquhart, O'Rourke, Kent and Gillette having overlooked this essential engineering factor, I had to call the bank to find that 50 cents made a roll. Then the problem reduced to the following equation in integers:

$$5n^2 + 50r = 3(5n + 2500r^2)$$

where n is the number of nickels, r is the number of rolls of cents, and the unknown gate is $G = 5n + 50r$. This reduces to $n(n - 3) = 10r(150r - 1)$ and the only solutions I could find were $r = 0$; $n = 0$ or 3. So I think it was a holiday and maybe 3 suckers contributed a gate of $0.15 U.S."

"My bank won't take no pennies in rolls of 50," argued Cal Klater with an ambiguous double negative, "so I multiplied the first equation by 12 and reduced it to

$$(300r - 1)^2 - 15(2n - 3)^2 + 134 = 0$$

which is a diophantine of the form $x^2 - ay^2 = b$. The solutions of this are, successively, x = 1, 41, 49, 329, 391, 2591 3079, 20399 . . ., and only the last one is of the form $300r - 1$. This gives $r = 68$, $n = 2635$ and the gate, G = $165.75. I carried my work a lot farther and concluded that if there was another solution, Nick could afford to install curium-studded plutonium parking meters."

"With radio to signal violations to headquarters," concluded Professor Neare. "There are an infinite number of solutions, but they are spread pretty thin. To get them, we can use the generator

$$r_k = 3842r_{k-1} - r_{k-2} - 12.8$$

and start from $r_0 = 0$ and $r_1 = 68$. In cycles of 5, there will be 3 fractional solutions followed by 2 in integers. So the next solution is r_5 = 14,815,522,849,321,172, which would mean G = $36,097,898,055-048,764.15, if anyone cares.

"Our new problem was born in a freak blizzard on Frisco's Skyline Boulevard last month and Guest Professor Budd will tell you how."

"Well, Noah, it was this way. We don't keep many snowplows in that district and the storm kind of surprised us after a 25-day drought. We got one plow started at 5 p.m., and when it kept on snowing steadily, we sent a follower at 8 p.m. These plows operate at constant tonnage and the follower caught the leader at midnight. When did it start snowing?"

[*Cal Klaters were Richard Jenney, R. E. Philleo, E. P. Goodrich, Anne Othernut (J. Charles Rathbun) and John L. Nagle. Guest Professor Budd is Charles T. Ledden.*]

New Publications

Housing Report. Economic and construction problems involved in adjusting the housing situation to a peacetime economy are discussed in the Fifth Annual Report of the National Housing Agency (recently reorganized as the Housing and Home Finance Agency). The 294-page report covers the 1946 activities and accomplishments of the Office of the Administrator and of the three constituents of the Agency—the Federal Home Loan Bank Administration, the Federal Housing Administration, and the Federal Public Housing Authority.

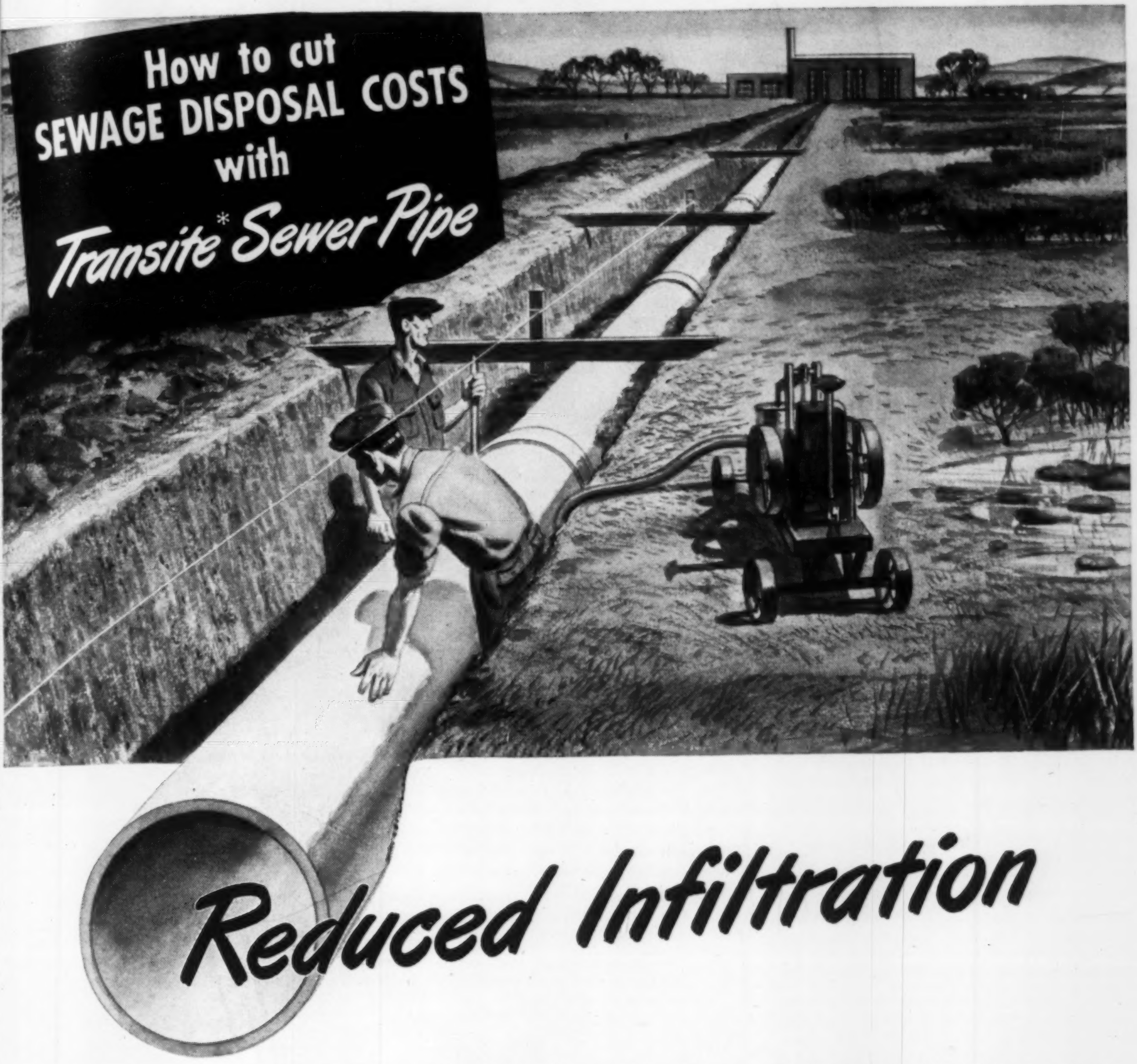
Problems of Stability. A paper on "Problems of Aerodynamic and Hydrodynamic Stability," by D. B. Steinman, M. ASCE, has been reprinted from the Proceedings of the Third Hydraulics Conference and is now available as Bulletin 31 of the University of Iowa Studies in Engineering. Inquiries should be addressed to the University of Iowa, Iowa City, Iowa.

Industrial Safety. To determine the precautions that should be taken to protect operators of road equipment and the public exposed to the hazards of road work, the National Safety Council has issued a revision of its Industrial Data Sheet D Con. 1, entitled "Motor Graders, Bulldozers, and Scrapers." The data sheet may be obtained from the Council, 20 North Wacker Drive, Chicago 6, Ill., at a graduated scale of prices—30 cents for single copies and 10 cents each for lots of 1,000 or more. Council members may order at half price.

Highway Safety. A 46-page "Selected Bibliography on Highway Safety" has been prepared by the Highway Research Board at the request of the National Committee for Traffic Safety. Single copies are priced at 45 cents each. Special prices for quantity lots will be furnished on request to the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

Industrial Waste Disposal. To guide plant managements in setting up company organizations to handle problems of industrial waste disposal, the Manufacturing Chemists' Association has made available a manual of step-by-step procedures. Copies may be obtained from the Association, 608 Woodward Building, Washington 5, D.C.

How to cut SEWAGE DISPOSAL COSTS with Transite* Sewer Pipe



Reduced Infiltration

DESIGNERS who have used Transite Sewer Pipe find that two factors—*tighter* joints and *fewer* joints—help to reduce ground water infiltration to an absolute minimum. Transite's sleeve-type joints make up tight and stay tight in service. Transite's long 13-foot lengths reduce the *number* of joints in the finished line.

These safeguards against infiltration cut down the volume which the line must carry. In addition, Transite has a high flow capacity (n=.010). This combination of reduced infiltration and better flow characteristics makes possible one of two immediate economies. Either smaller diameter pipe may be specified, or as an alternate saving, the use of flatter grades with correspondingly lower excavation costs may be considered.

In the long run, treatment costs are kept to a minimum . . . plant capacity conserved for the increased loads incident to future community growth.

Lower installation costs, too. Its long 13-foot lengths and fewer joints also make it easier to lay Transite Sewer Pipe to line and grade. Light in weight, it is readily handled. Many sizes, in fact, can be lowered into the trench without heavy mechanical handling equipment.

Transite Sewer Pipe is made of asbestos, cement and silica by a special process which develops maximum strength and uniformity, then steam cured to provide unusual resistance to corrosion. It is available in 4 strength classes in sizes to 36", permitting selection of the pipe best suited to trench conditions and often eliminating the need for concrete cradles. For further details, write Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

Johns-Manville

Transite Sewer Pipe

JOHNS-MANVILLE JM PRODUCTS

NEW IN Education

FUNDAMENTAL CONCEPTS IN engineering education will be further emphasized at the Polytechnic Institute of Brooklyn with the introduction of a new degree of master of science in applied mathematics. Announcement of the program, designed to meet a growing need for men with a knowledge of mathematics which can be broadly applied in all fields of engineering, was made by Dr. Harry S. Rogers, M. ASCE, president of the Institute. Special fields of applied mathematics, in which the Institute will offer elective courses, include mechanics, mathematical physics, physical chemistry, electrodynamics, and mechanical vibrations.

THREE NEW MEMBERS have been appointed to the board of consultants of the Iowa Institute of Hydraulic Research, according to announcement of its director, Prof. Hunter Rouse, M. ASCE. New members are C. G. Paulsen, M. ASCE, Dr. M. D. Nichols, and G. B. Schubauer. They will fill vacancies left by expiration of the terms of Prof. Boris A. Bakhmeteff, Hon. M. ASCE, W. G. Hoyt, M. ASCE, and Dr. H. U. Sverdrup The board of consultants advises on research problems.

RESEARCH TRAINING AND experience for engineers planning careers in industry and government will be offered at Harvard University for the first time starting next fall. The program has been announced by Gordon M. Fair, dean of the Harvard Graduate School of Engineering, and chairman of the executive committee of the ASCE Sanitary Engineering Division. Two years of study beyond the bachelor's degree will be required for the new course, leading to a master of engineering degree. According to Dean Fair, the new degree will provide opportunity for students to conduct supervised investigation of a suitable engineering subject while continuing their formal education in an engineering field.

ACQUISITION OF A building 100×120 ft with ground and mezzanine floor space totaling 18,000 sq ft from the Federal Works Agency, has been announced by Thorndike Saville, M. ASCE, dean of the New York University College of Engineering. Part of the building will be converted into a large drafting room, while another portion will be utilized to house a supersonic wind tunnel, first of its kind in the New York area, Dean Saville said.

FUNDS FOR NEW air and water tunnels in the amount of approximately $25,000 have been authorized in a reorganized and expanded agreement between the U.S. Office of Naval Research and the University of Iowa Institute of Hydraulic Research. Prof. Hunter Rouse, M. ASCE, director of the Institute, made the announcement. Fundamental studies in hydraulics, previously sponsored by the Navy Bureau of Ships, are continued in the new ONR program. A $10,000 water tunnel for continued study of underwater behavior will be built along with a $16,000 air tunnel which is to be designed by engineers at the Institute. The tunnel will make and accurately control winds up to 70 mph and will be used to study the water resistance of ship models, Professor Rouse said.

THREE FELLOWSHIPS OF $1,000 each will be awarded to South American students for graduate study in engineering and science at the Carnegie Institute of Technology for the 1948–1949 academic year. Awarded by the Matthes Foundation, New York, the one-year fellowships are open to any Latin American student who has completed with distinction, or will have completed by next September, requirements for a bachelor's or higher degree in engineering or physical science. Examinations will be held in the candidates' respective communities. April 15 is the deadline for filing applications.

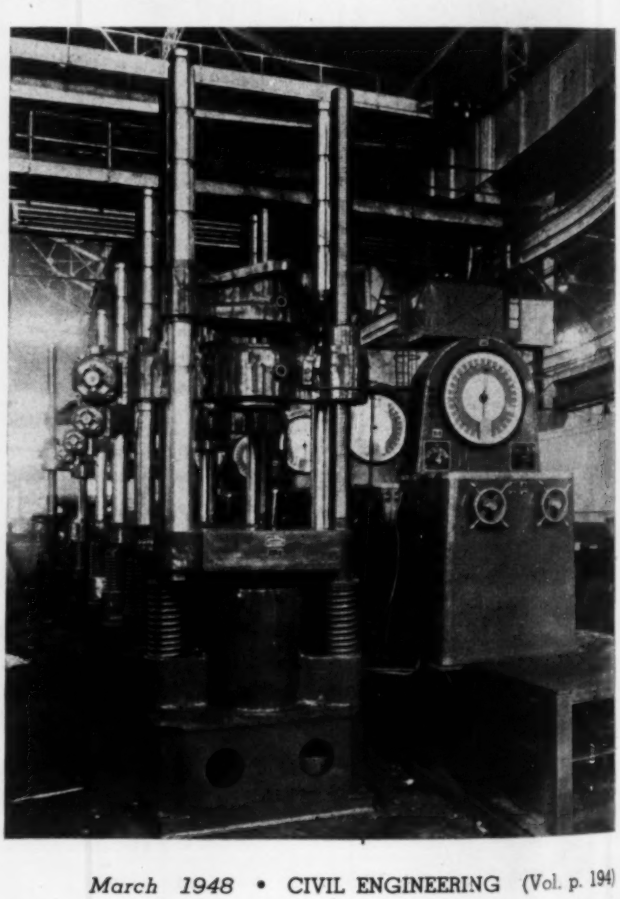
DEPENDENCE OF STRUCTURAL design of buildings and bridges upon sound art forms was pointed out by Prof. John O. Eichler, Assoc. M. ASCE, head of the civil engineering department at the Cooper Union, New York, in announcing a new course for students of both schools of art and engineering at the institution. The engineer, as well as the architect, must understand the esthetic principles of space, form and mass, Professor Eichler said.

SIXTY-ONE PERCENT of last June's graduates in engineering from New York University have found employment in the metropolitan area, a report by Dean Thorndike Saville, M. ASCE, shows. According to Dean Saville, this disproves a popular belief that most young engineers must go out of town to find jobs. Sources of jobs were found to be the university's placement bureau, college faculty members, personal inquiry, family or friends, newspaper, agency and engineering society leads. Seventy-six percent of those placed indicated they are satisfied, 16 percent are not, and 8 percent are undecided. Salaries ranged from $206 a month in the administrative field to $250 a month in specialized fields.

◆

Six Testing Machines Are Supplied to Pittsburgh Laboratory

SIX HYDRAULICALLY operated universal testing machines of the Baldwin-Tate-Emery high-column type have been supplied by the Baldwin Locomotive Works to the Pittsburgh Testing Laboratory for use in tension and compression tests. A 12,300-lb machine of 200,000-lb capacity will be used in the Pittsburgh office; the five larger ones, of 300,000-lb capacity and weighing 17,000 lb each, will be added to equipment in laboratories at Buffalo, Greensboro, N.C., Indianapolis, San Francisco and Cleveland. The machines are of cast and forged steel, with some brass fittings, and have a 12-in. stroke for testing materials to failure. Their universal character makes them suitable for testing many materials, including machine parts and structural components, but they will be used primarily for tests on metals, concrete, concrete pipe, highway guards, jacks, roof slabs, springs and special assemblies. They will bring to 40 the total number of such machines used by the company. The moving-table type of testing machine, of which these are examples, is the type usually employed by the materials testing engineer. Ordinarily they range from 60,000-lb to 750,000-lb capacities. A fixed table or floor-type machine is more common for larger capacities (from 600,000 lb to several million pounds). Dial indicators, at right in photograph, will rest on floor when installed, while bottom of each machine will rest in pit 31 in. below floor.



14-Story Structure Erected Speedily, Quietly by Arc Welding

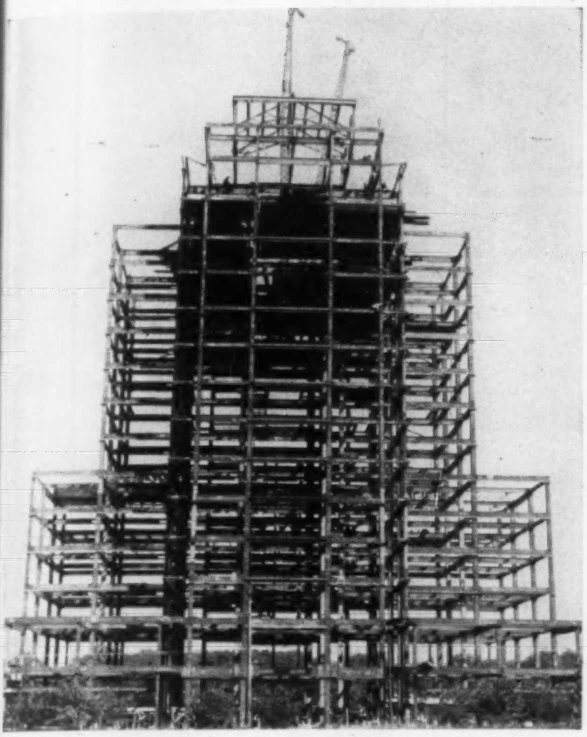


Fig. 1. All-welded structure of Hermann Professional Building.

By John R. Long, Mgr.

Houston Sales Office, Consolidated Steel Corp. of Texas
Orange, Texas

ONE of the tallest structures ever erected by arc welding is the Hermann Professional Building, a unit of the new Texas Medical Center under construction in Houston, Texas. The building is 14 stories with an additional first and second penthouse and hipped roof.

The 1400-ton structure (Fig. 1) was completely erected in 60 working days which is considered excellent speed for a building of this size and type. Considerable saving in steel tonnage was realized due to the structure's welded design. Eleven welders used approximately 40,000 pounds of Lincoln "Fleetweld 5" electrode for shop and field welding.

This is one of the first buildings of its type erected in the South, and exemplifies the rigidity and solidness of arc welded structures. There are 57 columns which, when set, were found to join perfectly.

Fig. 2 shows a connection from the spandrel beam to the corner column. Due to the flange connection, stiffener plates were required in the web and since the spandrel beam was centered on the flange of the column, the stiffener plate acts as a connection plate for the spandrel. Their entrant cut was necessary due to pipe chases in the floor.

As shown in Fig. 3, the column at the corner of the elevator opening is the only portion of the structure where cross-bracing was employed. It shows a typical connection of one of the many beams throughout the job that were offset from the center line of the columns. Due to the various types of conditions, a design was made of each connection and drawn in detail before any structural detailing was started. This enabled us to design nearly all connections for downhand welding. A welding sequence was employed throughout erection which proved economical in the fact that none of the structure had to be replumbed after welding had been completed. Engineers checked each column with a transit, and the column corners showed no more than a $\frac{1}{8}''$ variance from top to bottom.

The architect firms which had joint responsibility for this job and the erection sequence are Hedrick & Lindsley and Kenneth Franzheim, both of Houston. The general contractor is Linbeck & Dederick Construction Co., Houston, and the Consolidated Steel Corporation of Texas is the fabricator and erector.

Conspicuous by its absence on this job was the noise usually associated with structural work. Silent erection, one of the advantages of arc welded structures, is particularly important in areas where quiet must be maintained.

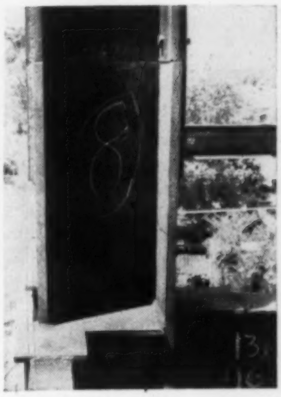


Fig. 2. Welded connections are simple in design. Bolts serve only to hold plates in position for welding.

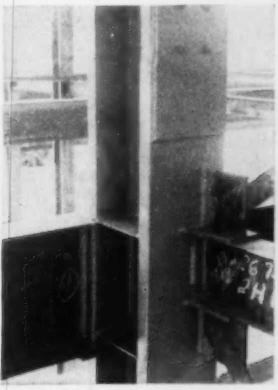


Fig. 3. Corner of elevator opening showing only place where cross-bracing is employed.

The above is published by LINCOLN ELECTRIC in the interests of progress.
Structural Design Studies are available free to architects and engineers. Write The Lincoln Electric Company, Dept. 152, Cleveland 1, Ohio.

Engineering Societies Library Compiles List of Important Books for Civil Engineers

THIS LIST OF some important books of interest to civil engineers has been compiled by the staff of the Engineering Societies Library. The books were selected from those added to the Library during 1947. Some equally good books may have been omitted, but the necessity for a short list has forced a choice among the large number of books received.

Hydraulic Measurements, 2d ed. H. Addison. 327 pp. 1946. John Wiley & Sons, N.Y. $5. A manual for engineers, wholly practical in treatment, covers the measurement of both open channel flow and flow in pipes and conduits; deals with liquids only.

Standard Specifications for Highway Materials and Methods of Sampling and Testing (American Association of State Highway Officials) 5th ed., 2 vols., 1947. The Association, Washington, D.C. $6 per set. Volume I is a classified compilation of present specifications for highway materials; volume II covers standard methods of sampling and testing highway materials.

Inventions and Their Management, 2d ed. A. F. Berle and L. S. DeCamp. 742 pp. 1947. International Textbook Co., Scranton, Pa. $6. This comprehensive work presents the principles and practices governing the technical, legal and business procedures of invention.

Clay Pipe Engineering Manual. 159 pp. 1946. Clay Sewer Pipe Association, Inc., 1105 Huntington Bank Bldg., Columbus, Ohio. $3. Gives engineering reference data applicable to the design and construction of sanitary sewer systems, storm water drainage systems, subsoil drainage, roadway drainage, and airport and railroad drainage.

Compressed Air Handbook, Applications, Equipment, Engineering Data and Test Procedure. 387 pp. 1947. Compressed Air and Gas Institute, 90 West Street, N. Y. $3. An authoritative guide for the proper installation, use and maintenance of air compressors and air-actuated equipment.

Architectural Construction, the Choice of Structural Design, T. Crane. 414 pp. 1947. John Wiley & Sons, N.Y. $6. Of interest to architectural engineers and practicing architects as well as students; intended to fill the void between a descriptive study of materials and types of construction and the final design of individual structural elements.

Science and Engineering of Nuclear Power, Vol. I. C. Goodman, ed. 503 pp. 1947. Addison-Wesley Press, Inc., Cambridge, Mass. $7.50. Covers the basic treatment of nuclear pile design and its practical application, in addition to background material necessary for their understanding; allied subjects such as control, monitoring chemistry of heavy elements, and fission products are also treated. Volume II in preparation.

Soil Mechanics, Its Principles and Structural Applications, 2d ed. D. P. Krynine. 511 pp. 1947. McGraw-Hill Book Co., N.Y. $5.50. Presents the principles used in the design, construction and maintenance of foundations of structures, and of structures made of earth material. The engineering applications of these principles are discussed, field and laboratory soil investigations are described, and the settlement of structures, its causes, prevention, and damage are considered.

Rammed-Earth House, A. F. Merrill. 230 pp. 1947. Harper & Brothers, N.Y. $2.50. Describes construction methods of low-cost, rammed-earth construction; discusses selection of material, faults that can be avoided, useful variations, such as soil-cement, and surfacing techniques; design features are presented.

Escalator Method in Engineering Vibration Problems, J. Morris. 270 pp. 1947. John Wiley & Sons, N.Y. $4.50. The escalator process, devised for the solution of Lagrangian frequency equations, makes it possible to solve a complicated system in a simple manner by dealing with its constituent parts. The solution of each of these parts is made available with appropriate linkage coordinates or reactions. The book also deals with other methods of computation of structural stresses, the theory of elasticity, methods of strain energy and least work.

Permafrost or Permanently Frozen Ground and Related Engineering Problems, S. W. Muller. 231 pp. 1947. J. W. Edwards, Inc., Ann Arbor, Mich. $3. Discusses the destructive action of frozen ground, the engineering problems peculiar to areas of permafrost, and investigation of frozen ground in connection with engineering problems.

Writing the Technical Report, 2d ed. J. R. Nelson. 388 pp. 1947. McGraw-Hill Book Co., N.Y. $3. Presents a review of those fundamental considerations that bear on the design and composition of the report, gives specific directions for the setup, outlines a systematic procedure for critical examination, and suggests a series of assignments for those who wish to use the book as a classroom text.

Principles of Tile Engineering, H. C. Plummer and E. F. Wanner. 453 pp. 1947. Structural Clay Products Institute, Washington, D.C. $4.50. A handbook of design for engineers who have use of structural clay tile.

Construction Estimates and Costs, 2d ed. H. E. Pulver. 653 pp. 1947. McGraw-Hill Book Co., N.Y. $6. A practical manual for the contractor and engineer concerned with accurate construction cost estimates and quickest, easiest methods of securing them.

Advanced Mathematics for Engineers, 2d ed. H. W. Reddick and F. H. Miller. 508 pp. 1947. John Wiley & Sons, N.Y. $5. Assuming a knowledge of mathematics through calculus, the authors deal with various special functions, integrals, series and equations, vector analysis, probability, and the operational calculus; problems are presented to emphasize physical application in the main fields of engineering.

Roadway and Track, W. F. Rench. 350 pp. 1946. Simmons-Boardman Publishing Corp., N.Y. $5. Modern methods of roadway and track maintenance are described and illustrated in the new edition of this standard practical handbook.

Technology of Industrial Fire and Explosion Hazards, Vol. I. R. C. Smart. 202 pp. Vol. II. 184 pp. 1947. Chapman & Hall, Ltd., London. 16s each volume. Fire wastage and research are dealt with in Volume I, as well as the thermal reactions of materials and fire risks with agricultural products, coal, industrial fuels, and gases. Hazards with light alloys, light alloy dust explosions, and explosive dusts produced in industry are considered. New materials, techniques, and processes are discussed in Volume II. Dangers due to toxic gases and the use of self-contained breathing apparatus are examined, while electrical fires and explosions due to static electricity and lightning are given close attention.

Sequential Analysis, A. Weld. 212 pp. 1947. John Wiley & Sons, N.Y. $4. Gives a full discussion of the new statistical technique known as Sequential Probability Ratio Test; explains the fundamental theory, the applications and potentialities of this method of analysis.

Portland Cement Technology, J. C. Witt. 518 pp. 1947. Chemical Publishing Co., Brooklyn, N.Y. $10. Manufacture of Portland cement is dealt with comprehensively from the selection of the raw materials to the analysis and testing of the finished product.

◆

New Engineering Curricula Proposed by N.Y.U. Dean

A NEW APPROACH to the problem of engineering education was recommended by Dean Thorndike Saville, of New York University's College of Engineering, a retiring Director of ASCE, in his annual report to University Chancellor Harry Woodburn Chase.

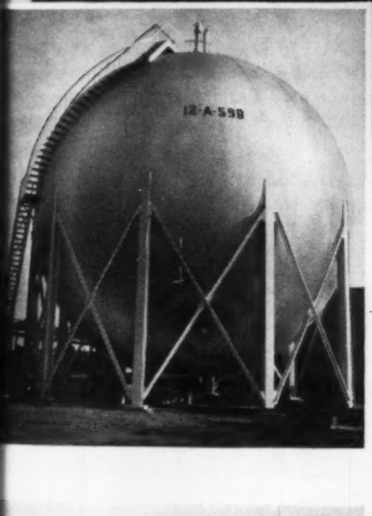
Under Dean Saville's plan, a general four-year course would be established for virtually all engineering students. This would be uniform for the first three years and would lead to the degree of Bachelor of Engineering. The first three years would include all the basic sciences and fundamental engineering subjects now offered, with the addition of history, public affairs and economics. Highly specialized subjects now on the increase in the sophomore and junior years would be omitted. The senior year would provide a number of electives designed for two types of students: (1) those expecting to terminate their engineering education in four years, and (2) those planning to, or selected to, take a fifth year of specialized work leading to such bachelor's degrees as A.E., C.E., M.E., and E.E.

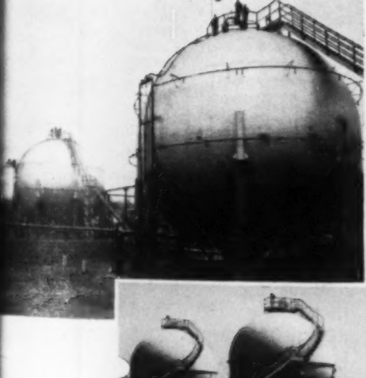
Perhaps 50 percent of the students, graduating in four years, would be prepared for a non-specialized career such as salesmanship, teaching and foreign service, Dean Saville reported. They would be better prepared for managerial posts in industry and government than many present engineering graduates and they could pursue graduate work if they so desired, he said.

Students headed for strictly professional objectives would take proper senior-year electives followed by a fifth year of work leading to a specialized bachelor's degree. They would be as well prepared as now for their first technological positions and better prepared as professional men and citizens, and a corollary of this plan would be the restoration of the master's degree to a really postgraduate level, Dean Saville pointed out.

Adoption of this program will depend on its acceptance by a dozen or more large engineering colleges after industrial and government agencies are convinced that it will be beneficial in preparing graduates for their employ, Dean Saville's report points out, adding that the plan would require special guidance of students to determine which should pursue the general and which the specialized undergraduate work.

PITTSBURGH·DES MOINES





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Thoroughly researched, skillfully engineered and painstakingly fabricated, Pittsburgh-Des Moines Steel Spheres meet every performance requirement for pressure storage of your volatile liquids or gases—with definite economy benefits in operation. A consultation on your storage problems can develop pertinent, helpful facts toward their solution. *Let us cooperate with you!*

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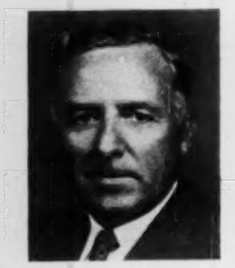
NEWS OF Engineers

Gail A. Hathaway, Vice-President ASCE, special representative to the Chief of Engineers, Department of the Army, in Washington, D.C., is the newly elected chairman of the United States National Committee of the International Commission on Large Dams, which is to hold a congress in Stockholm next June, the first since that held in Washington, D.C., in 1936. Mr. Hathaway's election took place at a meeting of the executive committee, at which work of reactivating and enlarging the U.S. Committee was completed. Mr. Hathaway began a three-year term as ASCE Director from District 5 in January 1944, and was appointed Vice-President from Zone II in March 1946, to fill the vacancy caused by the death of Col. A. C. Polk. He was elected a member of the Society in 1934 and has served on numerous committees since that time.


Gail A. Hathaway

H. N. Sutton recently was appointed chief safety inspector of Charlotte, N.C., after serving as acting head of the inspection division for the last few months. He had previously been in the city engineering department, as acting head of the Park and Recreation Commission and as engineer in charge of special projects.

Col. Ralph A. Tudor has been appointed chief engineer of the newly created Division of San Francisco Bay Toll Crossings. **Norman C. Raab,** of Sacramento, has been named design engineer of the project by Colonel Tudor. **Edwin F. Levy** is office engineer.

James Logan, chief engineer of the Santaniello Construction Co., Jersey City, N.J., has been elected president of the New Jersey Society of Professional Engineers for 1948. **Frank C. Mirgain** is a new director, and **John C. Remington, Jr.,** first trustee-at-large.

Bert R. Mullen, for 14 years affiliated with the engineering and administrative divisions of the U. S. Soil Conservation Service, has transferred to the Kansas City, Mo., office of the Corps of Engineers.

Charles P. Gross, retired major general and former chief of the Army Transportation Corps, is en route to take up his duties as a civilian aide to **Gen. Lucius D. Clay,** American commander in Germany. Mr. Gross recently resigned as chairman of the New York City Board of Transportation.

Franklin Hudson is newly appointed representative on the four-man board of the Linden-Roselle Sewerage Authority to serve until 1952.

Capt. Alden K. Fogg is new city engineer of San Diego, Calif. He took the position upon his retirement from the Navy early in February. On duty with the Navy at San Diego as public works officer of the 11th Naval District since November 1942, Captain Fogg directed the $14,500,000 aqueduct built to provide additional water for Navy personnel. Prior to that, Captain Fogg was located in Seattle as superintending civil engineer in charge of the Navy's work in Alaska. In his present position he succeeds **Neal D. Smith,** who became assistant city manager. **Russell A. Hall** has been acting engineer during the interim.

Col. Charles F. Williams has assumed command as district engineer of the New York district, Corps of Engineers, succeeding **Col. W. F. Heavey** who has retired from active duty. Colonel Williams has served with the Panama Canal department of the Corps, and as engineer in charge of the construction of the Bonneville Dam in Oregon. He served as deputy chief of staff in the First Army throughout its World War II operations.

Thomas S. Cassedy has been made a partner in the Baltimore firm of Whitman, Requardt and Associates, Engineers. Other members of the firm, all ASCE members, are **Ezra B. Whitman, Gustav J. Requardt, A. Russell Vollmer, Stewart F. Robertson, Roy H. Ritter,** and **Theodore W. Hacker.**

Harry F. Thomson has been elected president of the General Material Co., St. Louis, Mo., succeeding the late **A. C. Butterworth.** He has been a vice-president of the company since its incorporation in 1927. In January Mr. Thomson completed a term as ASCE Director, during which he served as chairman of the Committee on Publications. A past-president of the National Ready Mixed Concrete Association, he is currently serving as a director of the American Concrete Institute. He is also chairman of the Highways and Bridges Committee of the Metropolitan Plan Association of St. Louis, and has been active in the St. Louis Chamber of Commerce, the Associated Industries of Missouri, and other civic organizations.

Harry F. Thomson

John J. Ledbetter, Jr., has opened an office in Austin, Tex., as consulting engineer and attorney at law.

Hibbard Atwill Paine, of Odessa, N.Y., is retiring as civil engineer and surveyor for the U.S. Government at Ithaca, N.Y. After 60 years in active practice, Mr. Paine writes Society Headquarters that, "It has been a great pleasure to plan, construct, and then live to see the structures standing the gaff of time. Have no regrets and would like to start over again in civil engineering."

F. G. Eric Peterson, structural engineer of El Cerrito, Calif., has been appointed a member of the El Cerrito City Planning Commission.

Vaughn Wood has been appointed road commissioner of Imperial County, California, in charge of its 1948 road construction program calling for expenditure of more than $1,652,000.

Sol Ellenson, assistant director of public works for the city of Newport News, Va., has been promoted to the post of director. In the service of the city since 1925, he became assistant public works director in 1941.

Julius Adler, consulting engineer of Philadelphia, has been named American Public Works Association representative on the U.S. Department of Commerce standing Committee for Simplified Practice Recommendation R 163-39, Coarse Aggregates.

Col. D. W. Griffiths, of the Army Corps of Engineers, has been assigned to duty as a district engineer in Greece. Until lately he was stationed at Galveston, Tex., in a similar capacity.

Enos B. Cape, former lieutenant colonel in the Army Corps of Engineers, has been awarded the degree of Honorary Officer in the Royal Order of the British Empire for his wartime service as chief highway engineer on the road from the Persian Gulf to the southern border of Russia.

Fred Hornkohl is newly appointed head of the engineering and inspection division of the Roane Anderson Co., Oak Ridge, Tenn. **Warren A. Niles** has left the Atomic Energy Commission to take a position in the same division.

Wilbur Barrows has joined the staff of International Engineers, Denver, Colo.

Paul Ford has been transferred from the Bryson City, N.C., office of the U.S. Geological Survey to the Asheville sub-district office. **Harry Carlson** is now in charge of the Bryson City office.

G. H. Hickox, in charge of the hydraulic laboratory of the Tennessee Valley Authority since its organization ten years ago, has accepted a position as vice-director of the Engineering Experiment Station at the University of Tennessee. **Dean N. W. Dougherty** is director of the station.

Col. William E. Potter, until lately Kansas City District Engineer for the Corps of Engineers, has been transferred to Anchorage, Alaska, in a similar capacity. His successor at Kansas City is **Col. Paul D. Berrigan,** previously assistant to the division engineer, Western Ocean Division, at Sausalito, Calif. During Colonel Potter's tenure in the Kansas City District, the program of flood control, river improvement work, and military construction totaled more than $30,000,000. Early this year he opened bids for completion of the embankment and concrete spillway for the Harlan County Dam near Alma, Nebr., the largest civil contract in the District's history.

Col. W. E. Potter

SEWER DAMAGE COSTS INDUSTRY VAST SUMS

16—C THE DETROIT TIMES
Thurs., Feb. 13, 1947

Industrial Acids Wreck Sewers

Steel processing plants were blamed today for damage to Detroit's sewers which may cost more than $100,000.

CLAY PIPE NEVER WEARS OUT!

INDUSTRY throughout the nation is paying heavily for sewer damage, both in expensive maintenance of plant disposal lines and in costly replacements demanded by municipalities. No wonder farsighted industrial engineers insist on the use of Vitrified Clay Pipe. Not even the strongest common industrial acids or alkalies affect this chemical-resistant material. Vitrified Clay Pipe does not corrode, rust or crumble!

IF YOU NEED SPECIFIC INFORMATION on Clay Pipe, write the details to the office nearest you.

CLAY PIPE IS YOUR BEST INSURANCE AGAINST COSTLY ACID DAMAGE

CALCO CHEMICAL COMPANY specifications call for Clay Pipe and precise installation for all waste disposal lines in new Willow Island, W. Va. plant.

NATIONAL CLAY PIPE MANUFACTURERS, INC.
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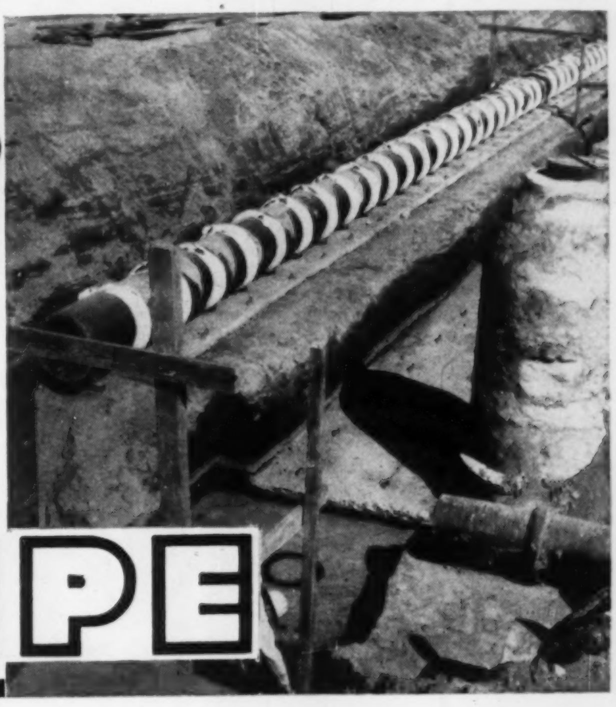
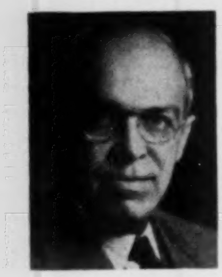


Howard Thompson Critchlow, who has just completed a term as ASCE Director, recently received the George Warren Fuller Award of the American Water Works Association. Chief engineer for the division of water policy, New Jersey State Department of Conservation, Mr. Critchlow was construction engineer for the New Jersey Delaware River Treaty Commission in 1924–1925. He has served as regional coordinator for the National Resources Commission Drainage Basin Study for the eastern half of the United States and as a consultant for the National Resources Planning Board and the New Jersey Defense Council.


Howard Critchlow

Sanford E. Thompson, president of the Thompson & Lichtner Co., Inc., of Boston, has been elected an honorary member of Committee C-9 on Concrete and Concrete Aggregates of the American Society for Testing Materials. Colonel Thompson formed the committee in 1914 and served as its first chairman.

Eugene E. Halmos is now design consultant for the Knappen Engineering Co., of New York. He was until recently an associate in the New York firm of Parsons, Brinckerhoff, Hogan & Macdonald.

Ralph R. Woolley, senior hydraulic engineer for the U.S. Geological Survey, Salt Lake City, Utah, has been reappointed for a two-year term to the lakes committee of the American Geophysical Union.

Leroy F. Harza, president of the Harza Engineering Co., Chicago, has opened a branch office in Seattle, Wash. Mr. Harza is a member of the engineering board for McNary Dam on the Columbia River, now under construction.

Clyde Myers is now on the staff of the Arizona Highway Department. He formerly was safety consultant for Phoenix, Ariz.

H. T. Livingston has been appointed chief engineer, Maintenance of Way and Structures, of the Chicago, Rock Island & Pacific Railroad Co. This represents a promotion from the position of engineer of bridges for the same railroad, in which Mr. Livingston has served for many years. His headquarters will continue to be in Chicago.

Dean S. S. Steinberg, of the University of Maryland college of engineering, has been appointed chairman of a committee to study plans for accrediting Latin American engineering colleges.

Charles H. Wagner is now project engineer on the Harlan County Dam on the Republican River near Alma, Nebr. A former army captain, he has been engaged in dam construction since 1926.

Gwynne D. Le Gro has been named road engineer of Wahkiakum County, with headquarters at Cathlamet, Wash.

William T. St. Clair has joined J. E. Sirrine Co. as a building design engineer. Until lately Mr. St. Clair was assistant to the president of the Poe Hardware Co., Greenville, S.C.

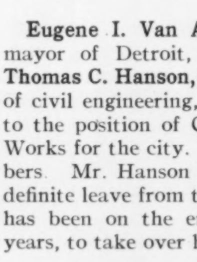
Wardner G. Scott recently became vice-president and chief engineer of the W. A. Lynn Construction Co., which is engaged in construction work for the Army Engineers on the Missouri River. Mr. Scott formerly was head of the Nebraska State Department of Roads and Irrigation.

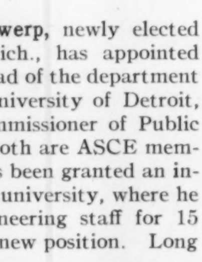
Leslie Williams and **Charles M. Upham, Jr.,** have formed a consulting firm specializing in city planning and traffic problems. A former editor of *Traffic Engineering*, Mr. Williams is now engineer for the American Transit Association. Mr. Upham was traffic engineer for the Hartford, Conn., Chamber of Commerce prior to wartime service in the Navy. Headquarters of the new firm, which will offer a traffic advisory service to communities, companies, and institutions, will be in New York City, with a branch office in Hartford.

E. George Stern has been promoted to the position of research professor in wood construction at Virginia Polytechnic Institute. He formerly was an associate professor. He is also director of the Institute's wood research laboratory.

Woodbury Brackett recently took office as city manager of Dover, N.H. For the past 17 years Mr. Brackett has served as town and municipal manager in several other New England communities.

Eugene I. Van Antwerp, newly elected mayor of Detroit, Mich., has appointed **Thomas C. Hanson,** head of the department of civil engineering, University of Detroit, to the position of Commissioner of Public Works for the city. Both are ASCE members. Mr. Hanson has been granted an indefinite leave from the university, where he has been on the engineering staff for 15 years, to take over his new position. Long active in the Michigan Section of the ASCE, he is currently serving as president. Mr. Van Antwerp, who has had a consulting practice in Detroit since 1928, has served as city councilman and in other civic capacities. He is a veteran of World War I, and has served in the National Guard and Engineer Reserve.


Eugene Van Antwerp


Thomas C. Hanson

Donald P. Roberts is in Arabia as engineer on the construction of an oil pipeline for the American Arabian Oil Co. He formerly was with the design department of the TVA.

Walter W. Colpitts is newly elected pres dent of the American Institute of Consulti Engineers. A member of the New Yo consulting firm of Coverdale & Colpit he began his eng neering career the Canadian Pacifi Railway and late worked on America railroads. In 19 he established wi his partner the fir bearing their nam Other officers of th Institute recentl named include Ez **B. Whitman,** Balti more, vice-presiden **Leslie G. Holleran** New York, treasurer, and **Rear Admir R. E. Bakenhus,** retired, secretary. **R. E Tatlow III,** of New York, was appointed member of the council.

Walter W. Colpitts

Charles K. Willey has resigned from th Knoxville, Tenn., office of the Frederic R Harris engineering firm to accept a positio with the Harza Engineering Co., of Chicag

Lewis P. Bradford has joined the staff o the city engineer's office at Jackson, Mis He was previously a civil engineer for th TVA at Knoxville.

Lt. Col. H. J. Kelly is now stationed a Fort Francis E. Warren, Wyo., with a aviation engineer unit. He was formerl in the Office Service Division of the TVA.

Charles Haydock, Philadelphia consultant, has been appointed a member of the Pennsylvania State Registration Board fo Professional Engineers by Gov. James H. Duff.

Sigmund Cohen has been transferred from the Detroit city engineer's office to the engineering division of the Department o Water Supply, with the grade of senior associate civil engineer. He will be responsible for civil, structural and hydraulic designs, plans and specifications. During World War II Mr. Cohen was a major in the Army Corps of Engineers.

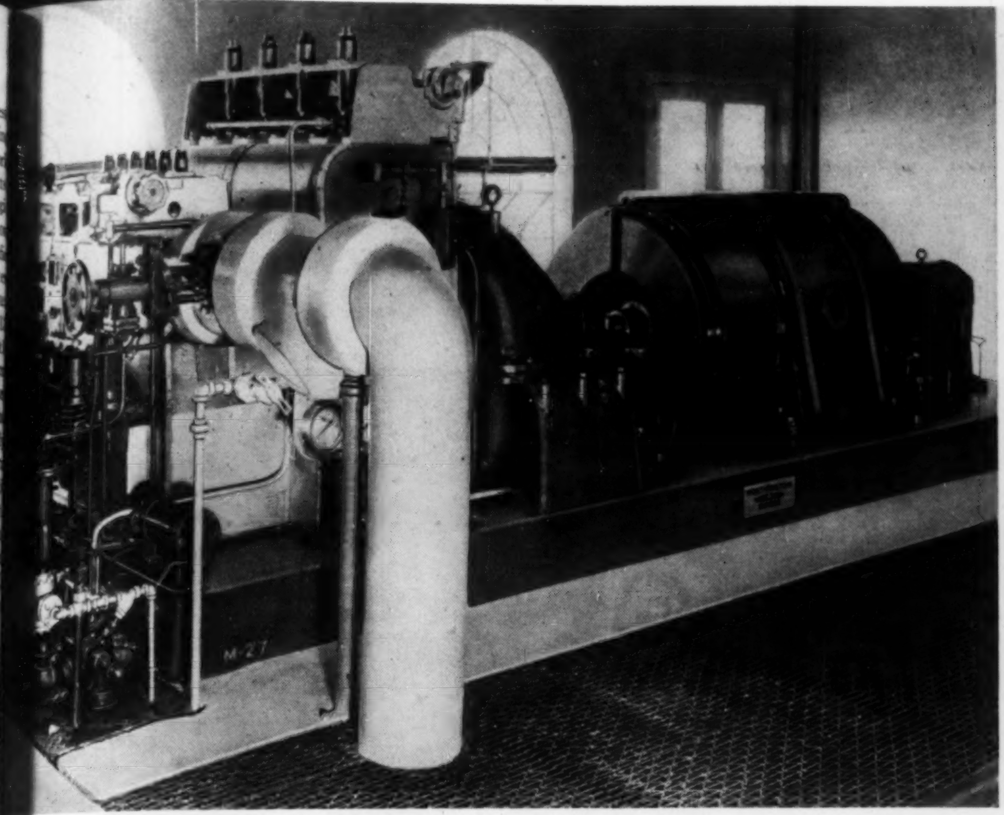
William R. Seeger has been named assistant chief engineer of the Marin Municipal Water District, San Rafael, Calif. He was formerly project manager of the engineering office of Clyde C. Kennedy in San Francisco.

Harry A. Balke has opened an office in Cincinnati, Ohio, where he will specialize in a structural design and consulting service. Until recently he was a consulting engineer for the American Bridge Co.

E. F. Emmick, for the past 23 years resident engineer for the Washington State Highway Department at Hoquiam, has been transferred to the department's headquarters at Olympia, in the capacity of consulting engineer in the plans and survey division.

Samuel B. Morris, chief engineer and general manager for the Los Angeles Municipal Department of Water and Power, has been appointed to the Colorado River Board of California by Gov. Earl Warren.

E. Lawrence Chandler, ASCE Eastern Representative, was elected vice-president of the newly formed Engineers Club of Washington, D.C., at its recent organizational meeting.



kw Worthington Turbo-Generator—installed in 1937 at Detroit Lakes, Minnesota, power station

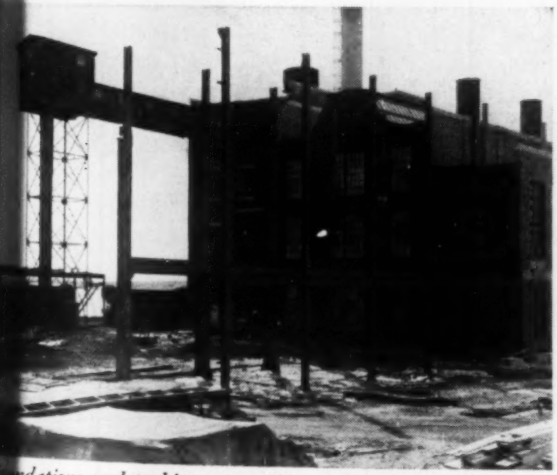
4000 kw More for Detroit Lakes

City of Detroit Lakes, a bustling Minnesota ort center, has long taken pride in its nicipally owned power plant. Through eful planning and good management, the nt has prospered . . . and the utilization of racted steam from the generator units for ating the business district and public build- is an advantage in Northern Minnesota asured beyond dollars and cents!

Detroit Lakes' order for a Worthington 4000 kw automatic bleeder turbine will bring to 7000 kw its total of Worthington installed turbine power. The first Worthington turbine, a 1000 kw unit, was installed in 1933; the second, a 2000 kw unit, in 1937.

The units have been inspected every two years and have been reliable and economical in operation.

Del-Mar-Va's Vienna Station Expands by Six Million



ndations and turbine room, Vienna Generating Station of stern Shore Public Service Company of Maryland (United gineers & Constructors, Inc., Philadelphia).

To provide more electrical energy to the Del-Mar-Va Peninsula, the Eastern Shore Public Service Company, a subsidiary of the Delaware Power and Light Company, is now undertaking a $6,000,000 expansion of its station in Vienna, Maryland.

Worthington was recently awarded the contract for the condensing unit to serve the latest 15,000 kw Turbo-Generator: a 14,000 sq-ft two-pass condenser with auxiliary equipment.

Four units are now in operation in this station—two 6,000 kw and two 7,500 kw. One 15,000 kw unit is being installed by the United Engineers and Constructors and a similar unit is on order. The two 6,000 kw generators operate at 300 psi, 675F, TT; the 7,500 kw and 15,000 kw units operate at 650 psi, 825F, TT.

NEWS

FROM THE PUBLIC WORKS FRONT

AS
REPORTED
BY
THE
DEVELOPMENT
ENGINEERS,
FIELD
SERVICE
REPRESENTATIVES
AND
CUSTOMERS
OF
WORTHINGTON

1

RTHINGTON PUMP AND MACHINERY CORPORATION, HARRISON, N. J.

If It Weren't for the Eels, a 38-Year Rec of Attention-less Pumping

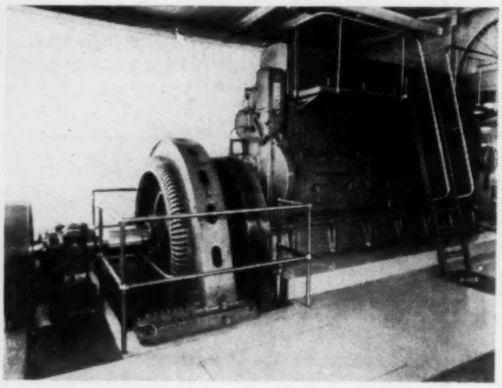
Edward V. O'Donnell, Superintendent, shown wi 38-year-old Worthington turbine pump at Gardner, Mass. pumping station

Back in 1909, the Perley Brook Pumping Station of Gardner, Mass., installed a Worthington 12 in. turbine pump, driven by a 200 hp, 1150 rpm motor.

This unit pumps water from the Cowee Pond—an auxiliary reservoir with 200,000,000 gallons storage capacity—into Crystal Lake, the main reservoir. The pump is in operation an average of four months each year, handling approximately 83,000,000 gallons per month.

Mr. Edward V. O'Donnell, the present superintendent, who assisted in the installation of the pump, reports—38 years later—that this Worthington pump has never required any replacement parts or repair work of any description.

It has weathered two floods. After the second one, the pump casing was opened to remove several eels. No other work was required.



Worthington EE-6, 750 hp Diesel engine—Village of Kenyon, Minnesota

Plant Efficiency Up 25%
Production Costs Down 55%
Power Selling Price Down 40%

Worthington equipment has played an important part in the efficient and economical production of electric power in the municipal plant at Kenyon, Minn. Following is a progress report of this plant, which is now considered a show place among the smaller municipal plants in the Midwest.

In 1932, two 300 hp and one 125 hp Worthington four-cycle engines were installed.

During the first full year, 619,740 kwhr were generated, at 10.14 kwhr per gallon of fuel and at a cost of 2.39¢ per kwhr on th switchboard. Average sale was 4.87¢ per kwh

In 1938, 983,220 kwhr were generated, a cost of 1.437¢ per kwhr on the switchboar and average sale was 4.31¢ per kwhr.

Then, in 1939, one 750 hp Worthingto four-cycle engine was installed, and the follow ing year showed 1,305,120 kwhr generated 11.98 kwhr per gallon, at a cost of 1.308¢ pe kwhr at the switchboard and average sale (a lower rate) of 3.7¢ per kwhr.

By the end of 1946, overall plant productio efficiency had reached a rate of 12.76 kwhr pe gallon, production cost had dropped to 1.17 per kwhr at the switchboard, and average sa (at a still lower rate) had arrived at the low 2.92¢ per kwhr.

Further increased load resulted in purcha of a 1440 hp Worthington supercharged uni

Thus, in a period of 13 years, plant efficienc was increased 25%, from 10.14 kwhr per ga lon of fuel to 12.76 kwhr . . . production cos decreased 55% from 2.39¢ per kwhr o switchboard to 1.172¢ per kwhr . . . electri power selling price was reduced by 40% fro 4.87¢ per kwhr to 2.92¢ per kwhr.

At the time the new equipment was co tracted for, there was no indebtedness on th plant. The entire investment to that date ha been paid from the profit on the electric sold to the consumers. There was also a ba ance in the treasury in Government bonds $35,520.00.

In 1946 a new office and warehouse w erected and a large addition to the generatin station to house the new 1440 hp engine an to provide for the new switchboard, and al to provide a new work shop. Revenue certi cates were issued to finance this new constru tion and equipment.

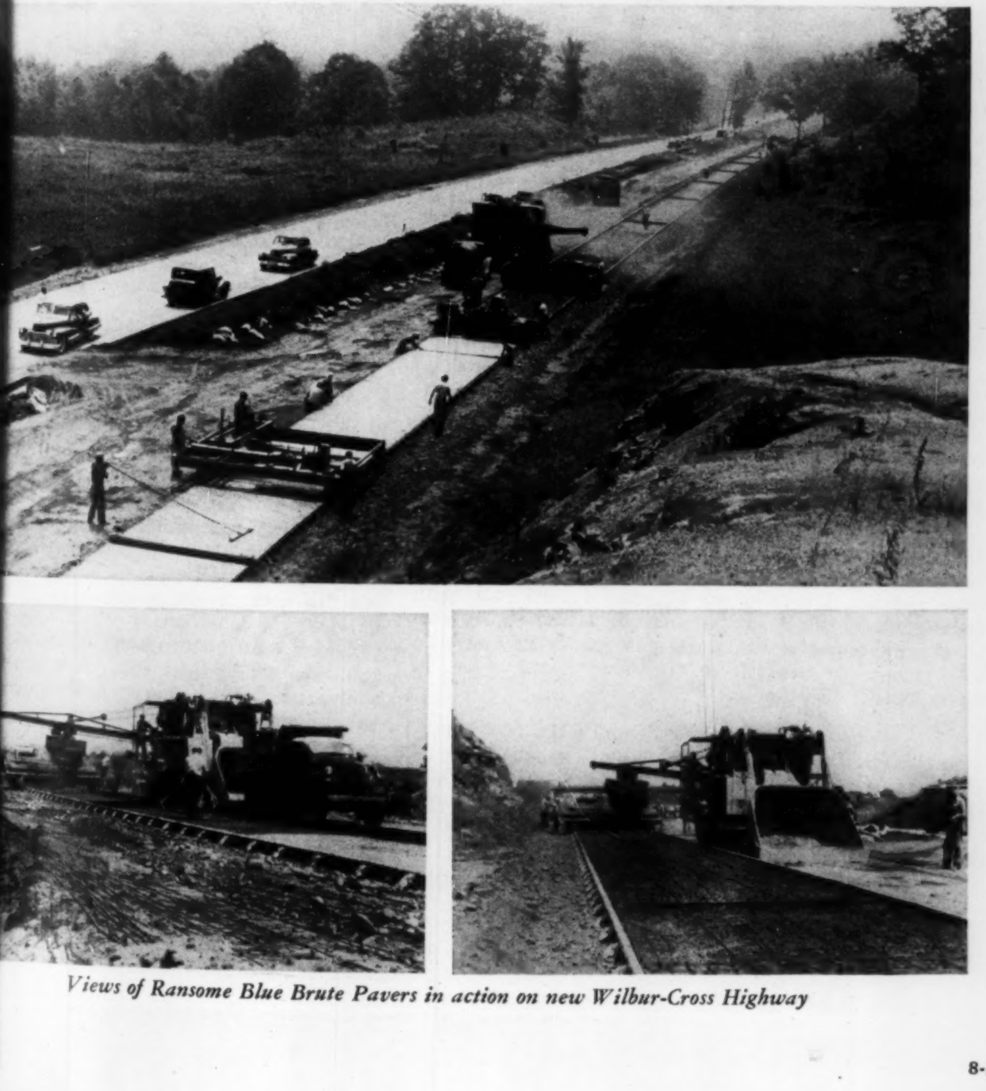
public works NEWS

Worthington Pump and Machinery Corporation • Harrison, N. J.

Blue Brute Pavers Pushing Work on Connecticut Super-Highway

as resumed on the Wilbur-Cross High-
hich is the great traffic link between
ork and New England.
nding from the Merritt Parkway in the
estern section of Connecticut, the new
state super-highway will provide a
hway from New York to the Massachu-
ate line at Union, Conn., carrying non-
rcial traffic into the vacation land and
ial centers of New England. Present
les call for completion in January, 1950.
spring contracts for placing a total of
feet of 8-inch reinforced concrete
nt in the towns of North Haven, Wall-
and Meriden, were placed with L. G.
e and Son at North Haven. This con-
used two Ransome 34 E Blue Brute
on the job—12 miles of 4-lane park-
ch lane 22 feet wide with an 8 ft shoulder.
king hard against time, a Ransome 34
Drum Paver poured the North-South link, and a Ransome 34 E Single Drum Paver poured inter-sections and widening strips. Both were equipped with the hydraulically-controlled boom and bucket combination that has made the Ransome paver a faster-laying, more versatile machine.

Originally, the contractor's batching plant was set up to meet the requirements ordinarily required by such a job, the plan being for the Dual Drum to pour the bottom layer, and the Single Drum the top layer. After the job was started, however, it soon became apparent that the pace set by the two Blue Brutes was too great for the batching plant. As a result, the Ransome Dual Drum paver was given the job to do alone, which it did at an average rate of 2800 feet per day, and 3100 feet during one single day run—an on-the-job confirmation of the fact that, for pure economy and time-saving paver operation, only a Ransome can compete with a Ransome.



Views of Ransome Blue Brute Pavers in action on new Wilbur-Cross Highway

Deceased

Col. William Greene Atwood (M. '10) retired consulting engineer, died on January 24 at his home in Winter Park, Fla. His age was 75. Director of the division of communications in Central Europe for the American Relief Administration under Herbert Hoover, Colonel Atwood was in charge of the reestablishment of Central European railroads. He also headed the American Railway Commission to supervise reconstruction of Serbian railways. During World War I he had charge of the extensive terminal construction for the AEF at St. Nazaire, France, and was holder of an AEF citation and an officer of the French Legion of Honor. He had served as assistant engineer, division engineer and chief engineer on several American railroads. Beginning in 1924, he had a consulting practice in Ithaca, N.Y., for many years.

Joseph Charles Boyd (Assoc. M. '12) died in Sacramento, Calif., on December 29, at the age of 83. Mr. Boyd became city engineer of Sacramento at the age of 21 and later was county surveyor for several years He went into private practice in 1907. A charter member of the Sacramento Section of the ASCE, Mr. Boyd served as president of the Section in 1925.

Frank Elam Brown (M. '26) for 30 years a partner in the firm of Smith & Brown, Engineers, Inc., of Chicago, died there on December 14. He was 59. Mr. Brown was a structural designer for Holabird & Roche, which later became the firm of Holabird & Root, architects, before establishing his own firm. Later he served as chief structural engineer for the architectural firm in addition to carrying on the work of his own organization. He helped design the Palmer House and Turbine Tower in Chicago, and was author of numerous articles on Chicago buildings and other structures.

Jonathan Burdette Brown (M. '28) of Davis, Calif., died suddenly on January 7. He was 60. Since 1922 Mr. Brown had been an extension specialist in irrigation at the college of agriculture, University of California. He had served as hydrographer for the California State Department of Engineering, and had been variously engaged as special agent for the U.S. Department of Agriculture doing irrigation investigations, as assistant professor of such investigations at the university, and as assistant state engineer. He was a past-president and charter member of the Sacramento Section.

Emott Davis Buel (M. '10) retired civil engineer, died in New York City at his home on January 29, at the age of 75. A specialist in foundation design, he worked on designs for the Hudson Tunnels and also on the foundations of several office buildings in the New York financial district. His first job was the design of a tunnel for the Louisville & Nashville Railroad. For some years he was chief engineer for John Monks & Sons, of New York, and more recently had been in Washington in connection with the foundation work on the Jefferson Memorial.

Edgar Anderson Burrow (Assoc. M. '25) civil engineer of Brady, Tex., died at his home there on January 17. Mr. Burrow was county surveyor for McCulloch about 25 years, engineer for the power and light company at San Angelo from 1900 to 1916, and later construction engineer of the West Texas Utilities Co. He went to Brady in 1921 to become civil engineer for the State Highway Department where he served for many years.

Edward Cowen Connor (M. '40) of Dallas, Tex., died at his home there on January 29, at the age of 65. Mr. Connor maintained a railroad and bridge engineering office in Dallas from 1905 to 1909, when he entered the field of public works construction. He became chief engineer to the city supervisor of public utilities in 1919, and two years later returned to private practice as a consulting engineer, representing numerous Texas public utilities in rate matters. For 28 years he was a consulting engineer for the Lone Star Gas Co. and for most of the major natural gas companies in the Dallas area.

Stanley Burson De Hart (Assoc. M. '39) captain, Army Corps of Engineers, died recently at the age of 41. Captain De Hart had been inspector of dredging for the New York State Department of Public Works at Ithaca, N.Y.; inspector for the U.S. Engineer Office at Sardis, Miss.; and assistant engineer in the U.S. Engineer Department at San Juan, Puerto Rico. Entering the Army at the outset of the recent war, he had served overseas and more recently was post engineer for the Harbor Defense of Key West, Fla.

Harry Custer Diesem (Assoc. M. '12) senior engineer appraiser for the Federal Land Bank, New Orleans, La., since 1937, died there on January 5. He was 70. Mr. Diesem investigated and reported upon many irrigation projects in Colorado and New Mexico and many drainage projects in Alabama, Louisiana and Mississippi, outlining and recommending loan policies during his long professional life. Following service as a captain in the Corps of Engineers during World War I, he became engineer appraiser for the Federal Land Bank at Wichita, Kans., in 1919.

Lester Fisher Ellis (Assoc. M. '17) civil engineer of Boston, Mass, died at his home in Lexington, Mass., on January 4. Mr. Ellis, who was 62, was for many years with the Boston engineering firm of J. R. Worcester & Co. More recently he had been vice-president of Gilbert Small & Co., of Boston.

John Sherrod Fenner (M. '36) county engineer of Bee County, Tex., died at Beeville on January 13. Mr. Fenner, who was 63, had spent most of his career in his home state, Texas. For some years he had a consulting practice in Beeville, and he had served as consultant for Nueces and Bee counties on road and bridge work. He has also been in charge of sanitary engineering and recreational improvements for Beeville.

Schuyler Hazard

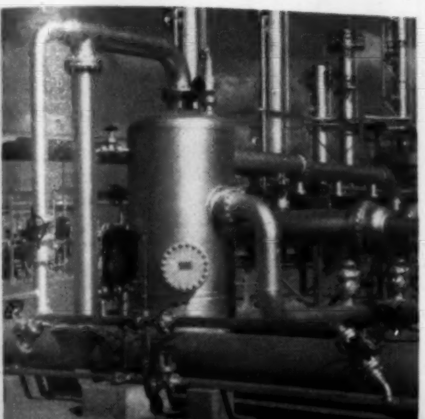
Schuyler Hazard (M. '98) consulting engineer of Albion, N.Y., died there on January 9. He was 80. Mr. Hazard was for many years engaged in railroad engineering with the Big Four, the New York Central, and other railroads, and had been special assistant to the chief engineer of the New York Central and resident engineer on the construction of the Pennsylvania Station in New York. He built the Union Station in Birmingham, Ala., and was chief engineer for the Catawba Power Co., on construction of a dam and power house on the Catawba River in South Carolina. During World War II Mr Hazard was associated with Koch and Fowler, Engineers, in charge of construction of Camp Bowie, Tex. Later he was with the Corps of Engineers at Denison, Tex., and subsequently, for almost two years, with Charles T. Main, Inc., at the Holston Ordnance Works, Kingsport, Tenn. In 1945 he returned to Albion to resume private practice.

Richard Howard Goode (Affiliate '20) for 38 years active in dredging operations in the Detroit area died on January 8. He was president of the Dunbar & Sullivan Dredging Co. there. Starting his career in 1909 with the Buffalo Dredging Co. on the Livingston Channel work in the Detroit River, Mr. Goode four years later became assistant superintendent on the New York State Barge Canal. He resigned the following year to become superintendent on the same project for James Stewart & Co. He went to the Dunbar & Sullivan Co. as vice-president and general manager in 1916.

Gilbert George Hall (Assoc. M. '14) senior planning technician in the office of the Regional Planning Engineer, Washoe County, Nevada, died in Veterans' Hospital in Reno on December 19. Mr. Hall, who was 62, spent his early career in railroad work. Later he had a private practice at South Bend, Wash., and for some years served as city engineer there. A veteran of World War I, he served during the recent war as civilian area engineer at the Sierra Reserve Ordnance Depot, Herlong, Calif.

Shaler Charles Houser (M. '17) professor of engineering and treasurer of the University of Alabama for 36 years, died on January 11. He was 68. Mr. Houser was for many years in charge of all the university's construction work. He became assistant city engineer of Mobile in 1899 and a year later engaged in general contracting work. Later, before joining the university staff, he served as design engineer, engineer in charge, and chief engineer on railroad work here and in Cuba.

Conway Bethune Hunt (M. '91) died at his home in Georgetown, a suburb of Washington, D.C., on December 20. He was 86. Mr. Hunt was for 33 years chief engineer of highways for the District of Columbia until his retirement in 1930. He became a member of the civil engineering staff of the Metropolitan and Washing-



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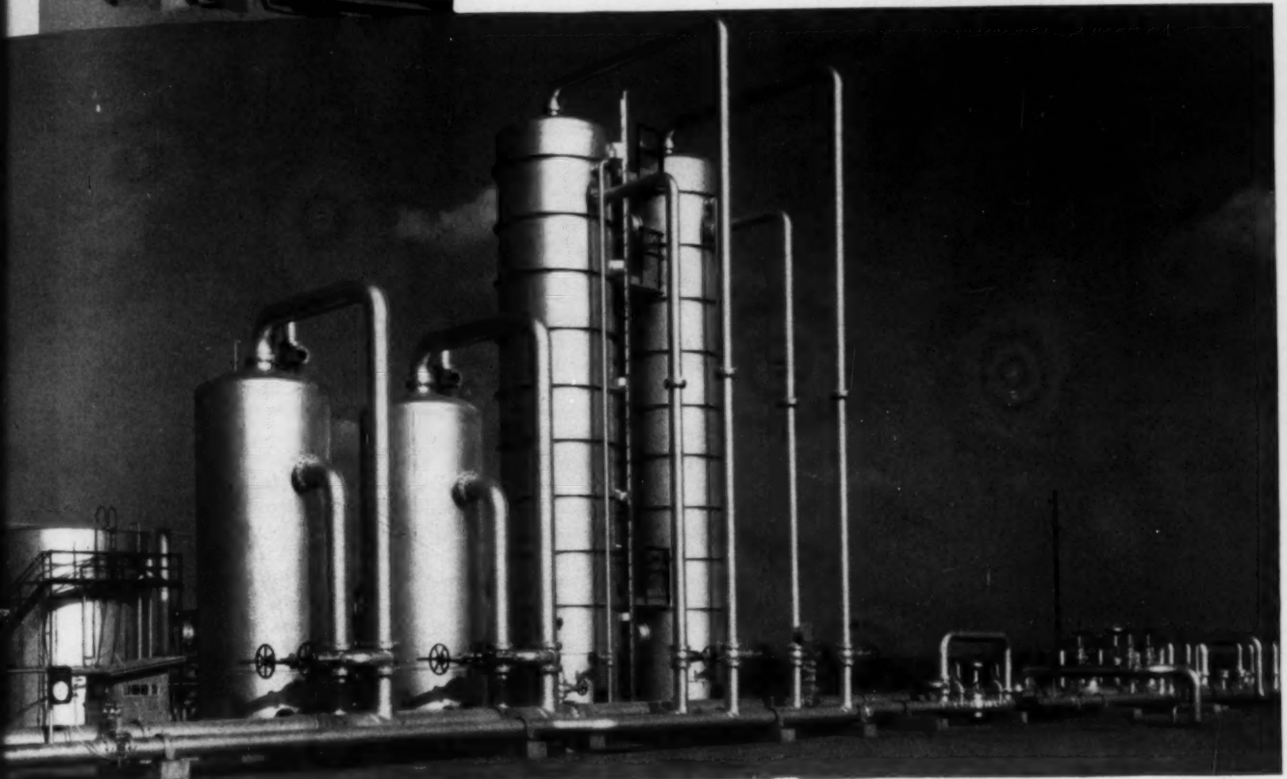

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ton Branch of the Pennsylvania railroad in 1882, leaving eight years later to become assistant engineer of bridges with the District Highway Department. During World War I he served with the Corps of Engineers as a major. Mr. Hunt supervised the building of the Washington, D.C., Union Station and its approaches while serving with the District Highway Department.

George Hunt Hutchinson (M. '93) of Pittsburgh, Pa., died on January 2, at the age of 87. For many years Mr. Hutchinson was active in railroad location and the installation of ore and coal-handling machinery docks on the Great Lakes. He was for 25 years chief engineer of the Northwestern Fuel Co., at St. Paul, Minn. At one time he made an investigation and reported to the Aluminum Company of America on the possibilities of port development at Port Alfred, Grand Baie, Saguenay River, Quebec. For 15 years prior to his retirement in 1944, he had been assistant chief engineer of the Pittsburgh & Ohio Valley Railway Co., a subsidiary of the Pittsburgh Coke & Iron Co.

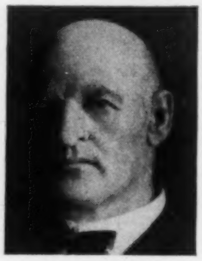
James Lewis Lochridge (M. '25) died suddenly on January 2 at his home in Amarillo, Tex. He was 59. A consulting and designing engineer on a number of large irrigation and water supply projects in Texas, Mr. Lochridge entered the partnership of Floyd & Lochridge in Dallas in 1925. The firm became engineers for the city of Waco, Tex., in charge of construction of a new water supply for the region. Becoming senior engineer for the PWA in 1936, he was assigned to the Lower Colorado River Authority Docket at Austin in connection with the construction of the Buchanan, Inks, Austin and Marshall Ford dams. His most recent work was as chief of engineering and surveys for the Bureau of Reclamation at Amarillo.

Guy McMurtry (M. '09) died on January 23 at his ranch near Somesbar, Calif. Mr. McMurtry, who was 78, was one of the oldest members of the San Francisco Section. He was for several years with the Bureau of Public Roads in California, and about 25 years ago joined the California Division of Highways as superintendent of maintenance of the Klamath River road. He retired eight years ago.

William Lindsay Malcolm (M. '38) director of the school of civil engineering at Cornell University since 1938, died in an Ithaca, N.Y., hospital on January 18. He was 63. Dr. Malcolm began his teaching career at Queens University, Kingston, Ont., his alma mater, in 1907. He designed and built the university stadium, hockey rink and sanitary engineering building. From 1914 to 1919 he served overseas with the Canadian Army Engineers, returning to Queens University where he remained until taking his place on the Cornell faculty. An authority on sanitary engineering, Dr. Malcolm had served as city engineer of Stratford, Ont., associate city engineer of Guelph, Ont., and as consultant on Canadian highway and building programs.

Clark Edwin Mickey (M. '22) chairman of the civil engineering department at the University of Nebraska, Lincoln, Nebr., died on January 18, at the age of 64. He became an instructor at the university in 1908 following his graduation there, was named assistant professor in 1919, and chairman of the engineering department a year later with a full professorship. Professor Mickey served also as a consulting engineer on several state and government projects and commissions, including the Flood Control Committee of the U.S. House of Representatives from 1927–1930. He was the author of several engineering reports and surveys.

Charles Hunter Locher, Sr. (M. '22) construction engineer, died on January 16 at his home in Glasgow, Va., at the age of 85. Mr. Locher's work included $16,000,000 worth of construction on the New York Independent Subway System while associated with Frederick L. Cranford, Brooklyn subway contractor, from 1925 to 1929. He served as construction consultant for the TVA from 1933 until his retirement in 1935. From 1899 to 1904 Mr. Locher was a member of the firm of Winston & Company & Locher, which built the Wachusset Dam and six sections of Weston Aqueduct for the Boston water supply system. From 1917 to 1923 he was construction manager for the Miami Conservancy District at Dayton, Ohio. His career included work on the New York State Barge Canal, Shoshone Dam at Cody, Wyo., Mississippi River levees, and part of the Catskill Aqueduct in New York. He was inventer of the aerial dumping device for Lidgerwood cableways and the wagon type drill to facilitate rock excavation.



Charles H. Locher

James Rutherford Rumsey (M. '31) of Grand Rapids, Mich., died on December 27, at the age of 67. He was sanitary engineer of the Michigan State Stream Control Commission, with headquarters in Lansing. Mr. Rumsey began his career in 1907 in Grand Rapids as a member of the firm of Rumsey & Works, municipal engineers. He became engineer of public works in East Grand Rapids in January 1922, later occupying the positions of principal assistant engineer, assistant city sanitary engineer, and construction engineer. In 1930 he became superintendent of sewage treatment works in charge of all operation, maintenance and new construction, a position he occupied until taking over the duties of sanitary engineer.

Willard Wilson Troxell (M. '37) chief of the engineering laboratories of the Glenn L. Martin Co., Baltimore, Md., died in a hospital there on January 26, at the age of 54. Mr. Troxell was bridge designer for J. E. Greiner & Co. from 1914 to 1917, leaving to serve with the Army Corps of Engineers during World War I. From 1921 until 1935 he was associated with W. W. Pagon, Baltimore construction firm, and later engaged in research for the WPA and the U.S. Department of Agriculture. In 1940 he joined the Glenn L. Martin Co. as senior stress analyst.

Reid Whitford (M. '96) retired engineer of Philadelphia, Pa., died in February 1947, according to word just received at Society Headquarters. He was 92. Beginning in 1883, Mr. Whitford was for many years U.S. assistant engineer in charge of Georgetown Harbor and Winyaw Bay, S.C. Later he served as secretary and engineer of the Sanitary and Drainage Commission for Charleston County, South Carolina, and as U.S. appraisal engineer at Conshohocken, Pa.

Albert William Zesiger (M. '09) retired chief engineer of the Cleveland Metropolitan Park Board, died on January 9, at the age of 79. He had served in the park board position for 15 years prior to his retirement in 1940. Mr. Zesiger began his career as a bridge engineer in parks for the City of Cleveland, became engineer of construction in the building inspector's office, and later served as bridge engineer in the county surveyor's office. He was chief engineer of bridges for the Ohio State Highway Department at Columbus before taking over the work of chief engineer for the park board.

Walter Gustaf Zimmermann (Assoc. M. '08), died at the Hinsdale, Ill., Sanitarium on January 13. He was 71. For almost half a century Mr. Zimmermann was associated with the American Bridge Co. in Chicago with which he became affiliated in 1903 as a contracting agent. He served as contracting manager in New Orleans, Atlanta, Ga., and Duluth, Minn. In 1926 he was appointed assistant division contracting manager at Chicago and five years later became senior contracting manager, the position he held when he retired in 1945. His early professional work was with the Illinois Central Railroad and various engineering firms.

◆

Three-Year Highway Plan Develops Northwest Area

(*Continued from page 37*)

Progress of the contractors on their work has not been up to prewar standards. There have been many reasons for this, chiefly the following:

1. Scarcity of some materials
2. Scarcity of labor in some areas
3. Lowered efficiency of labor
4. Limited supply of equipment available

Considering the difficulties encountered by the states in reorganizing for this expanded highway construction program and the difficulties met by the contractors in carrying on the work, the progress is really better than could be expected. The groundwork has been well laid for proceeding with the program at a much accelerated rate when conditions become stabilized.

Mention should also be made of the progress that has been achieved in this area in the way of changed thinking with regard to highway revenue,

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the extent of the present highway systems and the remedies needed under the modified price structure of the postwar period. Two of the states appointed interim legislative committees in 1945 to study the highway situation within their borders and offer recommendations to the legislature. The other two states have recently provided for legislative interim committees to study their highway problems. The wealth of factual data already collected in the various states is available for use by these committees in considering desirable changes.

Result Will Be Better Highways

The work of these legislative committees together with a well informed public opinion on the problems involved in meeting the growing traffic needs of the nation, should be of great aid in supplying the states with the needed tools to provide for the safe and free flow of traffic over the highways.

It is hoped that the three-year federal-aid program of the Public Roads Administration will result not only in a large mileage of more adequately improved highways but also in the creation of a central agency to coordinate road improvements in each state. Such an agency should improve the administration of local road matters.

◆

Traffic Improvements Through Traffic Engineering

(*Continued from page 42*)

cities with organizations in which the traffic engineer does not absorb or become directly engaged in line functions. Especially in a small city, he might as a staff officer serve almost as a one-man department, calling on the police, the city engineer, the electrician, and others in administrative positions for assistance in the field work of surveys, installation and maintenance of devices, marking of pavements, and channelization of intersections.

Urban Traffic Is Half of Total

About half of all motor-vehicle travel is in cities. Yet many smaller cities are unable to afford full-time qualified traffic engineers and must therefore obtain their services on a part-time or advisory basis. Realizing this condition and the growing responsibilities of states in urban traffic problems, many state highway departments are now furnishing technical traffic engineering services to cities; if these services are not provided for the entire city, they may be available for streets used as state highways. This plan has met with considerable favor in many states. Both the communities and the motorists are benefited, pleasant working relations develop between state and city groups, and only small expenses are incurred by the state.

Engineer's Services Pooled

In a few cases several cities have pooled their resources to employ the services of a traffic engineer. Under this plan, the engineer spends a part of his time in each city, and if his time is not fully taken up by the cities, he may engage in other activities and in consulting work. Under such an arrangement, cities can assign young engineers to work under the part-time traffic engineer until they become adequately trained and qualified to assume full responsibility for the traffic work in their city.

Traffic Engineering Needs Support

There are no panaceas for highway traffic problems. Most of all, it must be recognized that lay opinions will never bring a satisfactory and lasting solution for traffic ills. Although engineering knowledge has now advanced to the point where it can be invaluable to all levels of government in meeting the responsibilities of public officials to provide safe and efficient traffic regulations and facilities, yet the traffic engineer cannot wave a magic wand or pull a trick out of a bag that will quickly correct all traffic ills. Like other public improvements, traffic engineering should not be delayed until it can be "economically justified"; few, if any, modern improvements ever actually meet this standard. Finally, traffic engineering, once established, must have administrative and financial support, free of politics, and the unbiased backing of public officials, both elected and appointed, if an effective job is to be accomplished.

◆

Planning the Watauga Project

(*Continued from page 24*)

stored water during a critical dry period. The energy would be produced at Watauga with an average head of 275 ft, at Cherokee with an average head of 110 ft, and at nine main-river plants below Cherokee with a combined head of 480 ft, making a total head of about 865 ft. Watauga Reservoir operation and the power added to the TVA system by the project are shown on Fig. 4 years for the twelve-year typical ru off period which is used in TVA pow studies.

Designed for Low-Flow Generation

Since the main purpose of Watauga project from a power po of view is to supplement the hyd power production of the system du ing periods of low stream flow, capacity of the installed units was planned that all the available pote tial energy could be generated duri the low-flow portion of an extreme dry year. The holdover-storage ty of operation will result in a wi drawal of part of the storage volu early in a low-flow period. The mainder will be held until such ti as the other major tributary res voirs have been drawn to relative low elevations.

The installed capacity of the tauga powerhouse was fixed so th sufficient capacity would be availa under these conditions of reduc head to develop the potential outp Toward the end of such a drawdo period in a dry year the generati would be at 90 to 95 percent week load factor with about 10 percent serve. The 50,000-kw installati will be sufficient to develop the ener potentially available during the dra down period of an average year at reasonable load factor.

Capacity of Power Plant

The Watauga plant will have dependable capacity of about 40,0 kw under the reduced head due reservoir drawdown; hence it will necessary to add additional capaci on the system to make available, at reasonable load factor and wi sufficient reserve capacity, the p mary power added by the operati of the project.

Two 25,000-kw units have be selected for the Watauga project, ea being directly connected to a Franc type turbine rated at 34,500 hp at critical head of 216 net ft. Criti head is the head at which the full g output of the turbine will equal t generator capacity at normal rati At 275-ft gross head, where the tu bines will operate most efficiently, capacity of one unit operating at t most efficient gate opening will about 40,000 hp. The normal gr operating head will vary from a ma mum of 309 ft to a minimum of 16

Project planning investigations reports for the TVA are made un the supervision of C. E. Blee, ASCE, Chief Engineer, and un the general direction of James Bowman, M. ASCE, Chief Wa Control Planning Engineer.

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STANDARD

APPLICATIONS FOR ADMISSION OR TRANSFER

March 1, 1948

Number 3

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in Civil Engineering *and to furnish the Board with data which may aid it in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board. Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

Grade	General Requirement	Age	Length of Active Practice	Responsible Charge of Work
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years
Associate Member	Qualified to direct work	27 years	8 years	1 year
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years

APPLYING FOR MEMBER

Abildso, Haakon Andreas (Assoc. M.) (Age 48) Structural Engr., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Anderson, Benton Rees (Age 58) City Engr., Clinton, Iowa; Chf. Engr., Park Board Commrs., Clinton, Iowa.

Blench, Thomas (Age 42) Irrigation Branch, Punjab PWD; Director, Irrigation Research and Asst. Executive Engr., West Punjab, Lahore (Pakistan).

Borden, Olney (Age 42) Private practice of engineering and land surveying, Liberty, N.Y.

Bower, Cecil Lloyd (Age 51) Dist. Bridge Engr., PRA, West Virginia Dist., Charleston, W.Va.

Brannan, Julius Henry (Age 54) Highway Engr., PRA, Location and Design Engr., Arizona Dist., Phoenix, Ariz.

Burky, John Drummond (Jun.) (Age 35) Maintenance Officer, PWD, Naval Shipyard, San Francisco, Calif.

Carpenter, John Solomon (Age 48) Asst. Dist. Engr. of Constr., FWA, Bureau of Community Facilities, Detroit, Mich.

Carroll, Marion Edmund (Assoc. M.) (Age 47) Supt., de Aeropuertos, Ministerio de Comunicaciones, Direccion de Transporte, Caracas, Venezuela.

Casson, Loyd Thomas (Assoc. M.) (Age 42) Bridge Engr., Terminal R. R. Association of St. Louis, Mo.

Clove, Franklin Ephriam (Age 55) Civ. Engr., City of Los Angeles, Calif., Superv. Engr. on storm drain and flood control projects, Los Angeles, Calif.

Damours, Leon Williams (Age 36) Engr., P-5, Bureau of Reclamation, Denver, Colo.

Dates, Albert John (Age 57) Member of firm, Jensen, Bowen & Farrell, Engrs., Ann Arbor, Mich.

Dawson, Bernard Maurice (Assoc. M) (Age 49) Secy., Dawson Bros. Constr. Co., Inc., Syracuse, N.Y.

Dechanz, Frederick William (Age 43) Chf. Draftsman, Parsons, Brinckerhoff, Hogan & MacDonald, New York City, N.Y.

Douglas, Walter Spalding (Age 35) Associate, Parsons, Brinckerhoff, Hogan & Macdonald, New York City, N.Y.

Edgar, Robert Franklin (Age 53) Prof. and Head of Dept. of Civ. Eng., Univ. of Pittsburgh, Pa.

Elder, Howard Kenneth, Sr. (Age 41) Asst. Res Engr., Bridge Dept., California Div. of Highways, Redding, Calif.

Ernest, Ralph Nelson (Assoc. M.) (Age 39) Comdr., CEC, U.S. Navy, Public Works Officer, U.S. Naval Training Center, Great Lakes, Ill.

Esch, James George (Assoc. M.) Pres., The Esch Constr. Co., Cleveland, Ohio.

Fitzgerald, John Paul (Assoc. M.) (Age 41) Civ. Engr. and Surveyor (private practice), Rhienbeck, N.Y.

Gossett, Franklin Rice (Assoc. M.) (Age 42) Lt. Comdr., U.S. Coast and Geodetic Survey, Washington, D.C.

Gruner, Edward Charles (Age 42) Member of firm, H. E. Gruner, Cons. Engrs., Basel, Switzerland.

Gwyther, Valentine Mackenzie William (Age 48) Res. Engr., Bloedel, Stewart & Welch, Ltd., Port Alberni, Vancouver, B.C.

Hertel, Raymond Ernest (Assoc. M.) (Age 38) Senior Highway Engr., P-5, Engr. of Programs & Planning, Div. 4, U.S. PRA, Chicago, Ill.

Hoebel, Otto Louis (Age 62) Head R. R. Engr., serving as Tech. Staff Engr., TVA, Knoxville, Tenn.

Hoechel, Julius Carl (Age 62) Structural Engr., Westcott & Mapes, Inc., New Haven, Conn.

Jimenez-Lopez, Jorge Jaime (Assoc. M.) (Age 39) Commr. of Interior, Govt. of Puerto Rico, San Juan, P.R.

Kofman, Menashah (Assoc. M.) (Age 56) Civ. Engr., Hq. Dept., Board of Water Supply, New York City, N.Y.

Langford, Joseph Herbert (Age 42) Gen. Supt., Bridge Div., Cleary Bros. Constr. Co., West Palm Beach, Fla.

Lindeman, Paul Gustave (Age 63) City Civ. Engr., Terre Haute, Ind.

Long, Robert Wood (Age 35) Member of firm, Long Constr. Co., Kansas City, Mo.

MacMedan, Godfrey George (Assoc. M.) (Age 51) at present unemployed; Aug. to Sept. 1947 Engr. (checker), James Allen Tuck, Cons. Industrial Engr., New York City, N.Y.

Marane, Alfred Carl (Assoc. M.) (Age 40) Asst. Res. Engr., Civ., P-5, Clark Hill Project, Corps of Engrs., Savannah, Ga.

Merrill, Robert Arthur (Age 44) Associate Prof. and Head, Dept. of Eng., Univ. of Chattanooga; Consultant on Industrial Eng. Problems, Chattanooga, Tenn.

Morse, Everett Dean (Age 42) Civ. Engr., Houston Lighting & Power Co., Houston, Tex.

Oliver, Frank Gillespie (Age 42) Sales Engr., Austin Bros. Steel Co., Dallas, Tex.

Prokopp, Edward Joseph (Jun.) (Age 35) Chf. Engr., J. L. Peters Co., Detroit, Mich.

Robinson, Bernard Linn (Age 46) Col., Corps of Engrs., U.S. Army Dist. Engr., Galveston, Tex.

Schaack, Charles Auguste (Age 51) Chf. Engr., Belval Works, ARBED, Grand Duchy of Luxembourg, 20 Ave. des Terres Rouges, Esch/Alzette.

Scott, Harold Austin (Assoc. M.) (Age 41) Chf., Multiple-Purpose Reports Sec., Corps of Engrs., Jacksonville, Fla.

Scott, Wardner Gibson (Assoc. M.) (Age 51) Vice-Pres., and Chf. Engr., W. A. Lynn Constr. Co., Lincoln, Nebr.

Sherman, Daniel Charles (Age 51) Member of firm, Jensen, Bowen & Farrell, Engrs., Ann Arbor, Mich.

Sorensen, Niels Chester (Age 62) Private practice, N. Chester Sorensen Co., Alhambra, Calif.

Thadani, Nebhraj Metharam (Age 44) Deputy Chf. Engrs., G.I.P. Ry. Victoria Terminus, Bombay, India.

Thomas, Mark Everett (Assoc. M.) (Age 42) Cons. Civ. Engr., San Jose, Calif.

Thompson, Frank Leslie (Age 44) Civ. Engr., Board of Water Supply, New York, N.Y.

Track, Frank Anthony (Age 58) Eng. Consultant and Specialist on subaqueous drilling, Panama Canal sea-level project, Joy Mfg. Co. and Panama Elec. Machinery Co., Ancon, C.Z.

Tuller, Jesse Daniel (Age 62) Owner and active Head, The Tuller Constr. Co., Redbank, N.J.

Turpin, Owen Wharton (Age 47) Member of firm, Hall, Turpin & Wachter, Archts. and Engrs., Baltimore, Md.

Visintainer, Alfred Alexander (Age 44) Engr. of Structures, Erie R. R. Co., Cleveland, Ohio.

Wachter, Frank Clement (Assoc. M.) (Age 44) Cons. Engr., Member of firm, Hall, Turpin & Wachter, Archts.-Engrs., Baltimore, Md.

Waldenmaier, Anthony (Age 50) Chf. Engr., Faleide Eng. Co., Chicago, Ill.

Warren, Ray (Assoc. M.) (Age 51) Cons. Engr., Greensboro, N.C.

Weathers, Thomas Denia (Age 42) County Engr., Road & Bridge Dept., Madison County, Huntsville, Ala.

Welden, Ernest (Assoc. M.) (Age 61) Member of firm, Welden Bros., Iowa Falls, Iowa.

Wilkie, Charles Baldwin (Assoc. M.) (Age 47) Res. Mgr., Spencer & Morris, Inc., San Francisco, Calif.

APPLYING FOR ASSOCIATE MEMBER

Barron, Reginald Arnold (Age 34) Head, Special Studies Sec., Embankment and Foundation Branch, Soils Div., U.S. Waterways Experiment Station, Vicksburg, Miss.

Beasley, Marvin Clifton (Age 31) Engr. (Civ.) P-3, U.S. Engr. Dept., Chf., Office Eng. Branch, Camp Hood Field Office, Temple, Tex.

Beets, Frank Arnold (Jun.) (Age 30) Res. Engr., Sverdrup & Parcel, Inc., Kansas City, Mo.

Birch, George Washington (Jun.) (Age 35) Engr. (P-5), U.S. Bureau of Reclamation, Denver, Colo.

Brodrick, Gordon Horth (Jun.) (Age 34) Civ. Engr. (private practice), Lander, Wyo.

Camejo, Daniel (Age 33) Chf., U.S. Office, Venezuelan Inst. of Sanitary Works (INOS), Caracas, Venezula.

Carter, Douglas Martin (Jun.) (Age 28) Project Engr., Florida Road Dept., assigned as Res. Engr. on bridge jobs, Melbourne, Fla.

Custer, David John (Age 32) Office Engr., Pierre Ghent & Associates, Washington, D.C.

Dragnett, William Vincent (Age 47) Structural Designer & Constr. Supt., Linde Air Products Co., New York, N.Y.

Duncan, James Leveridge (Age 44) Project Engr. P-5, FWA, Bureau of Community Facilities, Div. 6, Dallas, Tex.

Eckhardt, Jack Edward (Age 33) Associate Highway Engr., California Div. of Highways, Sacramento, Calif.

Elden, William Robert (Jun.) (Age 34) Civ. Engr. with Roy W. Christy, Gen. Contr., Decatur, Ill.

Faylor, John Dayton (Age 32) Div. Engr., Iowa Nebraska Div., Armco Drainage & Metal Products, Inc., Des Moines, Iowa.

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Geltner, Carl (Jun.) (Age 34) Engr. P-2, Federal Power Comm., New York Regional Office, New York, N.Y.

Gifford, Daniel Wenzell (Age 45) Section Head (P-4), U. S. Engrs., St. Louis, Mo.

Greene, Leroy F. (Jun.) (Age 30) Bridge Engr., Consoer, Townsend & Associates, Chicago, Ill.

Haak, Pere Olof (Age 36) Structural Designer, Chas. T. Main, Inc., Boston, Mass.

Hogle, James Carlton (Jun.) (Age 36) Major, Corps of Engrs., Regular Army, assigned as student, Advanced Engr., Officers' Course, the Engr. School, Ft. Belvoir, Va.

Holcomb, Robert Marion (Jun.) (Age 31) Prof. of Structural Eng., Texas Agri. & Mech. Coll., College Station, Tex.

Holstein, John Joseph (Jun.) (Age 33) Structural Engr., S. B. Barnes & Associates, Los Angeles, Calif.

Horacek, Godfrey Jerry (Age 34) Graduate Student, Georgia School of Technology, Atlanta, Ga.; 1946 to 1947 Architectural Designer, Gill & Biancuili, Archts., Chattanooga, Tenn.; previously with U.S. Army; Rocky Face, Ga.

Horton, Harold Burris (Jun.) (Age 34) Structural Engr. with Wyatt C. Hedrick, Archt. and Engr., Houston, Tex.

Hovorka, George (Age 28) Civ. Engr., Clinton National Laboratory, Oak Ridge, Tenn.

Karpuk, Anton, Jr. (Age 30) Design Engr., J. E. Greiner Co., Baltimore, Md.

Kraas, Alfred Hugo (Age 32) Structural Designer, Marshall & Gongwer, Washington, D.C.

Kugler, Donald William (Age 33) Supervisor, Plant Eng. Dept., Hughes Tool Co., Houston, Tex.

Lawrence, Elwood Arthur (Jun.) (Age 34) Engr. with Byrl D. Phelps, San Diego, Calif.

Lyon, Buell Russell (Age 47) Civ. Engr. P-3 (Associate), U.S. Forest Service, Ogden, Utah.

Malikopoulos, Stephanos (Age 39) Planning Engr., Hydr. Works Sec., Dept. of Public Works, Tritis Septembrious St., Athens, Greece.

Mays, Edward Duke (Age 45) Dist. Engr., Dist. 1, Arizona Highway Dept., Flagstaff, Ariz.

Mendez, Rafael Martin, Jr. (Jun.) (Age 35) Member of firm, O'Kelly & Mendez, Archts. and Engrs., San Juan, Puerto Rico.

Moore, Arch Douglas (Age 36) Engr., U.S. Corps of Engrs., Galveston, Tex.

Nies, Charles William (Age 47) Civ. Engr., Bureau of Sanitation, Los Angeles, Calif.

Olsen, Sivert Edward (Age 43) Office Engr., TVA, Elizabethton, Tenn.

Palmer, Milton Meade (Age 31) Senior Engr. (Site Planner), Pacific Islands Engrs., Station 10, Guam.

Parigot de Souza, Pedro Viriato (Age 32) Engr., Iguassu Improvements Com., also Associate Prof., Theoretical and Applied Hydraulics, Parana School of Eng., Curitiba-Parana, Brazil.

Pugh, William Hartley (Age 33) Engr., Vogt, Ivers, Seaman & Associates, Cincinnati, Ohio.

Purinton, John Bernard, Jr. (Age 32) Design Engr., Michael Baker, Jr., Inc., Cons. Engrs., Rochester, Pa.

Rangarajan, Vishnumpettai Arunachalamier (Age 31) Asst. Engr., PWD, Govt. of Madras, India; on deputation to United States with U.S. Bureau of Reclamation, Denver, Colo.

Ritchey, Forrest (Jun.) (Age 33) Engr. P-4, U.S. Bureau of Reclamation, Denver, Colo.

Samarzich, Warren Nichols (Jun.) (Age 34) Asst. Bridge Engr., California Dept. of Public Works, San Francisco, Calif.

Schroeder, Earl Emil (Age 37) Asst. to Chf. of Sec., Special Eng. Div., The Panama Canal, Diablo Heights, C.Z.

Sorensen, Erik Per (Age 33) Senior Structural Engr., Knappen Eng. Co., New York, N.Y.

Stevens, Charles Stephen (Age 31) Field Engr., The Pitometer Co. of New York, Worcester, Mass.

Towner, James Madsen (Jun.) (Age 34) Sales Engr., United States Gypsum Co., Chicago, Ill., Dallas, Tex.

Urban, William, Jr. (Age 33) Pres., Urban Constr. Co., Inc., Kansas City, Mo.

Ure, James Alma (Age 60) Engr. III, Utah Road Comm., Chf. Bridge Engr's. Office, Salt Lake City, Utah.

Venkataramanan, Thirumanilayur Subramania (Age 40) Instructor in Highway Eng., Coll. of Eng., Guindy, Madras, India.

Vincent, Loxley Harry (Age 51) Div. Engr., Kansas Highway Comm., Topeka, Kans.

Voelker, Raymond Fred (Jun.) (Age 34) Project Engr., Standard Oil Co. of Indiana, Chicago, Ill.; Wauwatosa, Wis.

Wagner, John Forrest (Age 45) Civ. Engr., Veterans Administration, Columbus, Ohio.

Warrington, Francis Carlton (Jun.) (Age 34) Contr. Engr., Pittsburgh-Des Moines Steel Co., Dallas, Tex.

Whitaker, Clair LaVerne (Age 35) Office Engr., U.S. Geological Survey, New York, N.Y.

Wiese, Ralph Albert (Age 30) Structural Engr., Aluminum Co. of America, Pittsburgh, Pa.

Wiggins, Benn Albert (Jun.) (Age 34) Structural Designer, Faisant & Kooken, Cons. Engrs., Baltimore, Md.

Wilbanks, James Lafayette, Jr. (Age 29) Mill Maintenance Engr. (converting), Memphis Mill., Kimberly-Clark Corporation, Memphis, Tenn.

Williams, Stephen Asa (Jun.) (Age 34) Engr. (Structural) P-2, Corps of Engrs., U. S. Army, St. Louis Dist., St. Louis, Mo.

APPLYING FOR AFFILIATE

Mitchell, Robie Lawton (Age 60) Attorney at Law, Mitchell & Pershing, New York, N.Y.

APPLYING FOR JUNIOR

Banerjee, Binay Kumar (Age 24) 1947 M.S. in Civ. Eng., Univ. of Minn.; Feb. 1945–Feb. 1946 Asst. Engr., C. & W. Dept., Gov't. of Bengal, Grain Storage Depot Constr.

Bartel, Herbert Herman, Jr. (Age 23) Instructor, Civ. Eng. Dept., Southern Methodist Univ., Dallas, Tex.

Elton, Earl William (Age 32) Bridge Draftsman, Washington Highway Dept., Olympia, Wash.

Gaigher, Rupert (Age 24) Asst. Prof. Officer (Soil Erosion), Div. of Soil Conservation, Pretoria, South Africa (B.S.C.E., and M.S. Agri. Eng., Iowa State Coll.).

Gowda, Kalladevanahalli Ramiah Suryanarayana (Age 22) Graduate student, Princeton Univ.; 1945 to 1947 Supervisor, Mysore State Highway Dept., India; Princeton, N.J.

Jennings, Thomas Shannon (Age 26) Instructor in Eng. Drawing and Descriptive Geometry, Univ. of South Carolina, Columbia, S.C.

Stueck, Cornelius Frederick Peter (Age 26) Asst. to Chf. Engr., Stupp Bros. Bridge & Iron Co., St. Louis, Mo.

ALA. POL. INST.

	Age
Botts, Carlos Fletcher, 1947	(27)
Ray, James Edward, 1947	(25)

CARNEGIE INST. TECH.

Baer, James Francis, 1947	(23)

CASE INST. TECH.

Hetzel, Milton Sherman, Jr., 1948	(25)

UNIV. OF CONN.

Oviatt, George Treat, 1948	(29)

CORNELL UNIV.

Goodno, Redmond Stephens, 1948	(24)
Woodward, Kenneth Gray, 1948	(23)

DREXEL INST. TECH.

Pratt, John David, 1947	(29)
Russ, Franklin Albert Jr., 1947	(24)
Silimeo, James Joseph, 1947	(21)

GA. SCHOOL TECH.

Smith, Mark Anthony, Jr., 1947	(23)

UNIV. OF ILL.

Grez, M., Patricio, 1947	(21)

UNIV. OF KY.

Hill, Clyde Brooks, 1947	(26)

LEHIGH UNIV.

Berkowitz, Morris, 1948	(30)
Jacobsen, Jacob Thorsten, 1948	(27)
Woodring, Richard Harold, 1948	(25)

MASS. INST. TECH.

Matter, Alfred Emil, 1947	(29)

MICH. COLL. OF MIN. & TECH.

Seay, Dudley Gene, 1947	(25)

MICH. STATE COLL.

Atwater, Clarence Edwin, 1947	(22)

UNIV. OF MINN.

Huso, Vernon Kenneth, 1947	(22)
Sorenson, Clayton Alfred, 1947	(25)

UNIV. OF NEBR.

Beezley, Nathaniel Willard, 1948	(24)
Ekblad, William Oscar, 1948	(25)
Lawson, Arthur Moore, 1948	(28)
Luedtke, Norris Eric, 1948	(31)
Scherich, Erwin Thomas, 1948	(29)
Sehnert, Paul Leslie, 1948	(26)
VanSant, James David, 1948	(30)
Williamson, George Robert, 1948	(21)
Yen, Robert Ark, 1948	(23)

N. MEX. COLL. OF A. & M.A.

Hartley, Carl Brazel, 1947	(26)
Schwettmann, William Henry, Jr., 1948	(23)
Slack, Lewis Cecil, 1947	(26)

UNIV. OF OKLA.

Gillett, Donald Houston, 1948	(23)
Henderson, Mervin Waits, 1948	(23)
Hoover, Blanton William, 1948	(25)
Meacham, John Ferrell, 1948	(24)
Mobley, George Frederick, 1948	(26)
Neal, Ancal, 1948	(22)
Rice, Paul Winston, 1948	(30)
Schaff, Joseph Francis, 1948	(23)
Settle, William Charles, 1948	(25)
Walker, Earl Eugene, 1948	(21)
Williams, Ivan Bunger, Jr., 1948	(21)
Woods, Gilbert Welch, 1948	(26)

PA. STATE COLL.

Althouse, William D., Jr., 1948	(21)
Baker, William Orr, 1948	(26)
Bielski, Stanley Michael, 1948	(23)
Erdman, Paul Bryant, 1948	(25)
Felsburg, Robert Ernst, Jr., 1948	(24)
Fleischer, Donald Ralph, 1948	(21)
Garbacik, Lewis Adam, 1948	(21)
Gross, William Henry, Jr., 1948	(24)
Haag, Charles Milton, 1948	(24)
Henry, Robert McFarland, 1948	(23)
Hnot, Joseph, Jr., 1948	(21)
Krotchko, George Daniel, 1948	(25)
Lawrence, Carl Lowry, 1948	(21)
Schleifer, Matthias Joseph, 1948	(23)
Tessier, Larry Orpher, Jr., 1948	(25)
Trax, Paul Thomas, 194	(21)
Ward, Richard Eugene, 1948	(25)
Wadlin, George Knowlton, Jr., 1948	(24)

PURDUE UNIV.

Schulman, David, 1948	(23)
Uhl, Robert Hart, 1948	(25)

RENS. POL. INST.

Buckley, James Molony, 1947	(23)

ROSE POL. INST.

Bogran Fortin, Fausto Daniel, 1947	(23)
Koebel, Frederick Eberle, 1947	(23)
Koontz, Marvin Bell, 1947	(27)
Lawson, Alfred Milton, 1947	(26)
Loomis, John Edward, 1947	(27)
Murdock, John Washburn, 1947	(21)
Newlin, Charles William, 1947	(23)
Rollings, Robert Irvin, 1947	(25)
Smith, Allen Pratt, 1947	(25)
Swihart, Gerald Robert, 1947	(27)

S. DAK. STATE COLL.

Jamison, Gordon Gibbs, 1947	(26)

TUFTS COLL.

Pittman, Alfred Stanley, 1948	(22)

UNION COLL.

Tick, Daniel Jay, 1948	(21)

UNIV. OF S.C.

Rush, James Seigler, 1948	(22)
Young, William Thomas, 1948	(21)

UNIV. OF TENN.

Shafer, Robert Weldon, 1947	(24)

UNIV. OF VA.

Guy, Briscoe Baldwin, 1947	(22)

UNIV. OF WASH.

Cotter, Robert John, 1947	(23)
Diehl, David Benjamin, 1947	(25)
Lamb, Loys Walter, 1947	(23)
Larsen, Walter Edwin, 1947	(26)
Nash, Melvin J., 1947	(25)
Nicholas, Charles Calvin, 1947	(23)

UNIV. OF WYO.

Rickey, Horace Bushnell, Jr., 1947	(23)

WASHINGTON UNIV.

Sachs,' Lewis Harvey, 1946	(20)

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Albertson, Abner Howard, Jr. (Jun. '47) Sales Engr. (At present a Trainee), Leeds and Northrup Co., 4901 Stenton Ave., Philadelphia (Res., 300 Mattison Ave., Ambler), Pa.

Alden, Donald Wayne (Jun. '47) Junior Civ. Engr., Bridge Dept., State Div. of Highways, 418 Custer Ave., Los Angeles (Res., 235 College St., Puente), Calif.

Allen, James Carson (Assoc. M. '47) Office Engr., The Utah Constr. Co., 57 East 4th South St. (Res., 2309 Preston St.), Salt Lake City 6, Utah.

Allensworth, William Burton (Jun. '47) Civ. Engr., Pipeline Dept., Creole Petroleum Corp., Las Piedras Estado Falcon, Venezuela.

Amoratis, Irma Elizabeth (Miss) (Jun. '47) Junior Engr., Brussel & Viterbo, 1630 Arcade Bldg. (Res., 1216 McCausland Ave.), St. Louis, Mo.

Andersen, Cedric Herbert (Assoc. M. '47) Chf. Engr., Summerbell Roof Structures Co., 1746 Thirteenth St., Oakland (Res., 110 The Uplands, Berkeley), Calif.

Anderson, William Joseph (M. '47) Special Asst. to Deputy Commr., U.S. Public Roads Administration, Federal Works Agency Bldg., Washington 25, D.C.

Aquadro, Robert Anthony (Jun. '47) Constr. Supt., Vappi & Co., Inc., 240 Sidney St., Cambridge (Res., 33 Wilson Ave., Northampton), Mass.

Arora, Gopal Dass (Jun. '47) Indian Students Union & Hostel, 25–26 Woburn Square, London W.C.1, England.

Ashby, James Paterson, Jr. (Jun. '47) Asst. Engr. of Diesel Elec. Loco. Design, Union Pacific R.R. Co., Room 504, Headquarters Bldg. (Res., 120 North 31st St.), Omaha 2, Nebr.

Asturias, Miguel Antonio (Jun. '47) Civ. Engr., Carretera Franklin D. Roosevelt, Seccion 7, Proyecto 6, C.F.D.R. (Res., Fourth Avenida Norte 30), Guatemala City, Guatamala, C.A.

Austin, James Richard (Jun. '47) Graduate Student, Univ. of Washington (Res., 202 West Blaine St.), Seattle 99, Wash.

Bailey, Robert Carroll (Jun. '47) Civ. Engr., Corps of Engrs., Dept. of the Army, Huntington Dist., Huntington (Res., 1120 Chestnut St., Kenova), W.Va.

Baker, Frederick John (Jun. '47) Maj., Corps of Engrs., U.S.A.; Quarters 0–17, Fort Belvoir, Va.

Bal, Joseph (Jun. '47) Student (Graduate), Univ. of Washington, 345B Sixteenth Ave., Seattle 22, Wash.

Bales, Clifford Shirley (Jun. '47) Junior Civ. Engr., State Div. of Architecture, 1120 N St., Sacramento, Calif.

Ball, Henry Fletcher, Jr. (Jun. '47) Apprentice Engr., Land Service Roads, State Highway Dept. (Res., 5108 Woodrow Ave.), Austin, Tex.

Bardgette, John Joseph (Jun. '47) Associate Civ. Engr., Humble Oil & Refining Co., Box 1271 (Res., 1720 Craig), Corpus Christi, Tex.

Bartle, Richard Milne (Jun. '47) 926 Michigan Ave., San Jose, Calif.

Barton, Cliff Smith (Jun. '47) Instr., Dept. of Eng. Mechanics, Rensselaer Polytechnic Inst., Troy, N.Y.

Barton, James Marion (Assoc. M. '47) County Engr., Marion County, Hamilton, Ala.

Bays, Grover Haynes (Jun. '47) Structural Designer and Draftsman, Parkersburg Rig and Reel Co., P.O. Box 1160 (Res., 1006 George St.), Parkersburg, W.Va.

Bellucci, Orpheus Robert (Jun. '47) Civ. Engr. I. (Junior Engr.), State Dept. of Aeronautics, 503 South 7th St., Springfield, Ill.

Benesch, Alfred (M. '48), (Alfred Benesch & Associates, Cons. Engrs.), 30 East Adams St., Chicago 3, Ill.

Bereman, John Samuel (Jun. '47) 1505 Mapleton, Boulder, Colo.

Bergson, Milton (Jun. '47) Junior Civ. Engr., State Div. of Highways, Spring and Second Bldg. (Res., 939 South Gramercy Place), Los Angeles 6, Calif.

Berry, Gene Allen (Jun. '47) Asst. City Engr., City of Bartlesville, Civic Center (Res., 116$^{1}/_{2}$ South Cherokee), Bartlesville, Okla.

Bessen, Seymour X. (Jun. '47) Asst. San. Engr., Chicago Pump Co., 2326 Wolfram St. (Res., 4251 Irving Park Road), Chicago 41, Ill.

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Bleimeister, William Carl (Jun. '47) Engr., International Salt Co., Inc., Sanders and West Fort (Res., 14344 Warwick Road), Detroit 23, Mich.

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Blumberg, Harold (Jun. '47) Supt. of Constr., Structural Builders Inc., 857 Broadway (Res., 1475 Townsend Ave.), New York 52, N.Y.

Bonderson, Paul Richard (Jun. '47) Asst. San. Engr., State Dept. of Public Health, Farm Credit Bldg., Berkeley (Res., 4120 Pacheco St., San Francisco 16), Calif.

Borrero, Pedro Manuel (Jun. '47) Ingeniero Jefe de la Div. de Malariologia, Servicio Cooperativo Interamericano de Salud Publica, Carrera 16 No. 12–93, Bogota, Colombia.

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Boyer, William Welch (Jun. '47) Instr. in Civ. Eng., North Carolina State College, C.E. Bldg., State College Station, Raleigh, N.C.

Brannan, Robert Wesley (Jun. '47) Field Chf., Eng. Surveys and Layouts, Div. of Eng., City of Toledo, Orange and Erie (Res., 2536 Pershing Drive), Toledo 12, Ohio.

Brewer, Herbert Lawrence (Jun. '47) Student, Univ. of Pennsylvania Graduate School; 2518 North 22nd St., Philadelphia 32, Pa.

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Burke, George Walter, Jr. (Jun. '47) Graduate Student, Georgia School of Technology, Box 240 (Res., 613 Kennesaw Ave., N.E.), Atlanta, Ga.

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Campbell, Kenneth Alexander (Jun. '47) Instr., Dept. of Civ. Eng., Michigan State College, East Lansing, Mich.

Carlson, Donald Emil (Jun. '47) Junior Civ. Engr., State Bridge Dept., Box 306, Butte City (Res., 2510 Grant St., Berkeley 3), Calif.

Carlson, Douglas Edward (Jun. '47) Junior Civ. Engr., City of Alameda, City Hall, Alameda (Res., 1150 Josephine St., Berkeley 7), Calif.

Carney, Harold Powell, Jr. (Jun. '47) Project Engr., Robert E. McKee, Gen. Contr., P.O. Box 1494, Waco, Tex.

Carrillo Batalla, Francisco (Assoc. M. '47) Cons. Engr., Apartado 668, Caracas, Venezuela.

Carter, Donald Bidwell, Jr. (Jun. '47) Rodman, New York, New Haven and Hartford R.R. Co., Union Station, Hartford (Res., 2174 Main St., Glastonbury), Conn.

Chapin, Hiram Thompson, Jr. (Jun. '47) Instr., Civ. Eng. Dept., North Carolina State College, Raleigh, N.C.

Christensen, James Philip (Jun. '47) Telephone Engr's. Asst., Interstate Telephone Co., South 165 Howard St. (Res., West 2101 First Ave.), Spokane, Wash.

Christensen, Martin Benton (Jun. '47) Draftsman, C. A. Franzen, 7437 South Lafayette Ave. (Res., 5937 North Hermitage Ave.), Chicago 26, Ill.

Clark, Wayne Gordon, Jr. (Jun. '47) 1091 North Holmes, Memphis, Tenn.

Collins, Robert Lewis (Jun. '47) Graduate Student, Civ. Eng. Dept., California Inst. of Technology, Pasadena (Res., 307 North Almansor St., Alhambra), Calif.

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TOTAL MEMBERSHIP AS OF FEBRUARY 9, 1948

Members	6,887
Associate Members	8,919
Corporate Members	15,806
Honorary Members	42
Juniors	6,866
Affiliates	75
Fellows	1
Total	22,790
(February 9, 1947	21,420)

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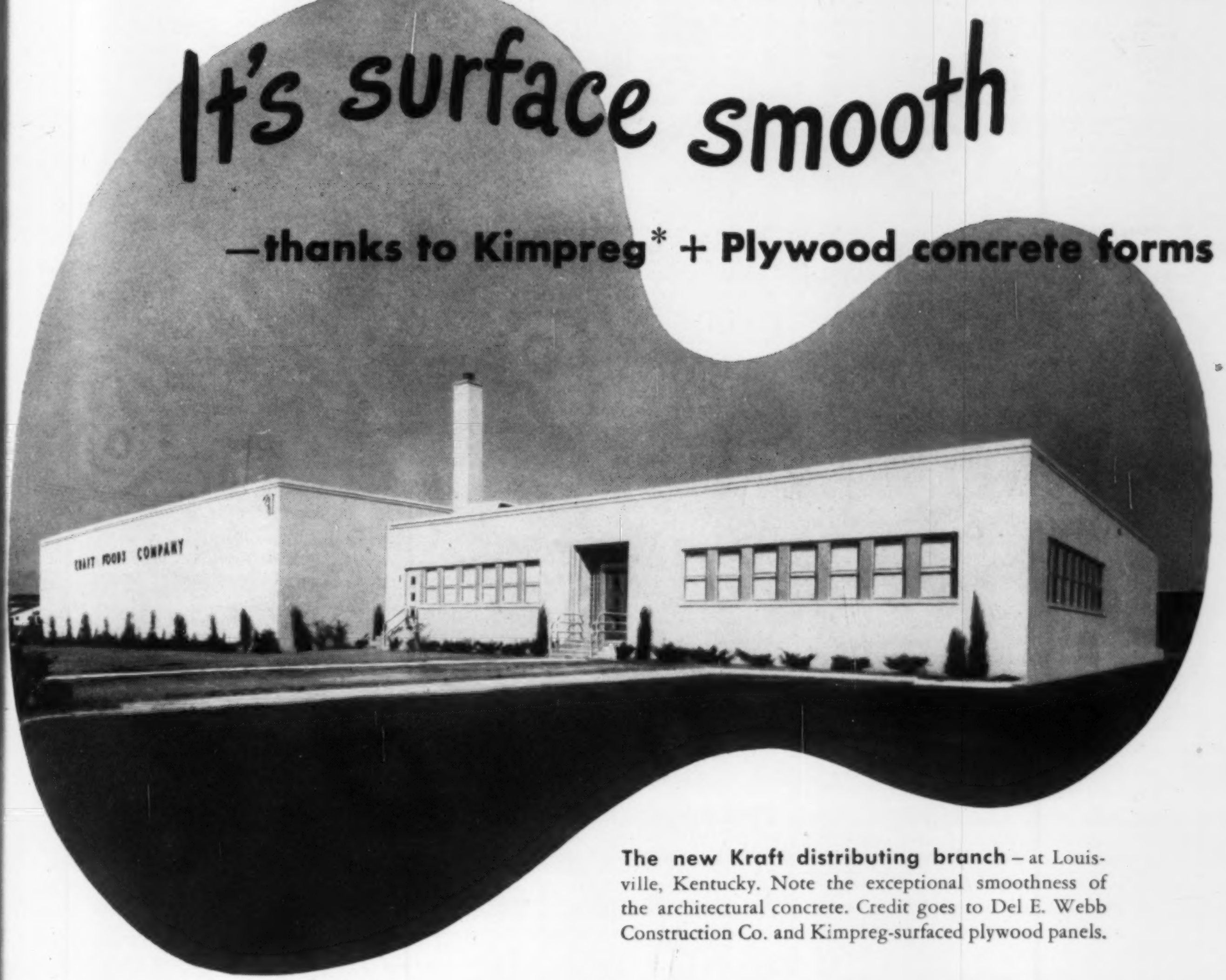

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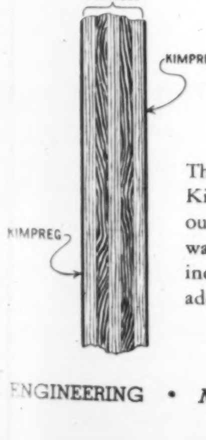

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Standish, John Herbert (Assoc. M. '47) Executive Engr., State Rivers and Water Supply Comm., Victoria, 100 Exhibition St., Melbourne, Australia.

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Stork, Oliver Fred (Jun. '47) Eng. Asst., Houston Urban Expressways, State Highway Dept., Hampshaw Bldg. (Res., 1407 Malone), Houston 7, Tex.

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Waggener, William Garnett (Jun. '47) Graduate Student, Civ. Eng. Dept., Texas Agri. and Mech. College (Res., Box 1953), College Station, Tex.

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Warren, Harold Emery (Jun. '47) Civ. Engr., Structural Design, Constr. Dept., Swift & Co., Union Stock Yards, Chicago (Res., 313 South York St., Elmhurst), Ill.

Watts, George Milton (Jun. '47) Hydr. Engr., Beach Erosion Board, U.S. Govt. (Res., 24 Sixteenth St., N.W.), Washington, D.C.

Weaver, Donald Gale (Assoc. M. '47) Staff Technician, Southern California Gas Co., 1700 Santa Fe Ave., Los Angeles (Res., 6814 Cedar St., Huntington Park), Calif.

Weber, John Gaylord (Jun. '47) (Weber Constr. Co.), 15th and Seymour (Res., 3901 Central Ave.), Cheyenne, Wyo.

Wells, Carlos Kenyon (M. '47) Div. Engr., Long Beach Water Dept., 215 West Broadway, Long Beach 2, Calif.

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White, Frank Trumbull (Jun. '47) Junior Civ. Engr., State Div. of Highways, Dist. IV Office, San Francisco (Res., 2608 Woolsey St., Berkeley 5), Calif.

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Williams, Jack Alfred (Jun. '47) Instr., North Carolina State College, Raleigh, N.C. (Res., 10 Main St., Charleston 2, W. Va.)

Wilson, Helen Hope Sauerwein (Mrs.) (Jun. '47) Care, Lt. Minter L. Wilson, Jr., "B" Troop, 51st Constab. Squadron, Army Post Office 2 Care Postmaster, New York, N.Y.

Wolin, Michael (Assoc. M. '48) Civ. Engr., Board of Water Supply, 120 Wall Street, New York (Res., 9525 Farragut Road, Brooklyn 1 N.Y.

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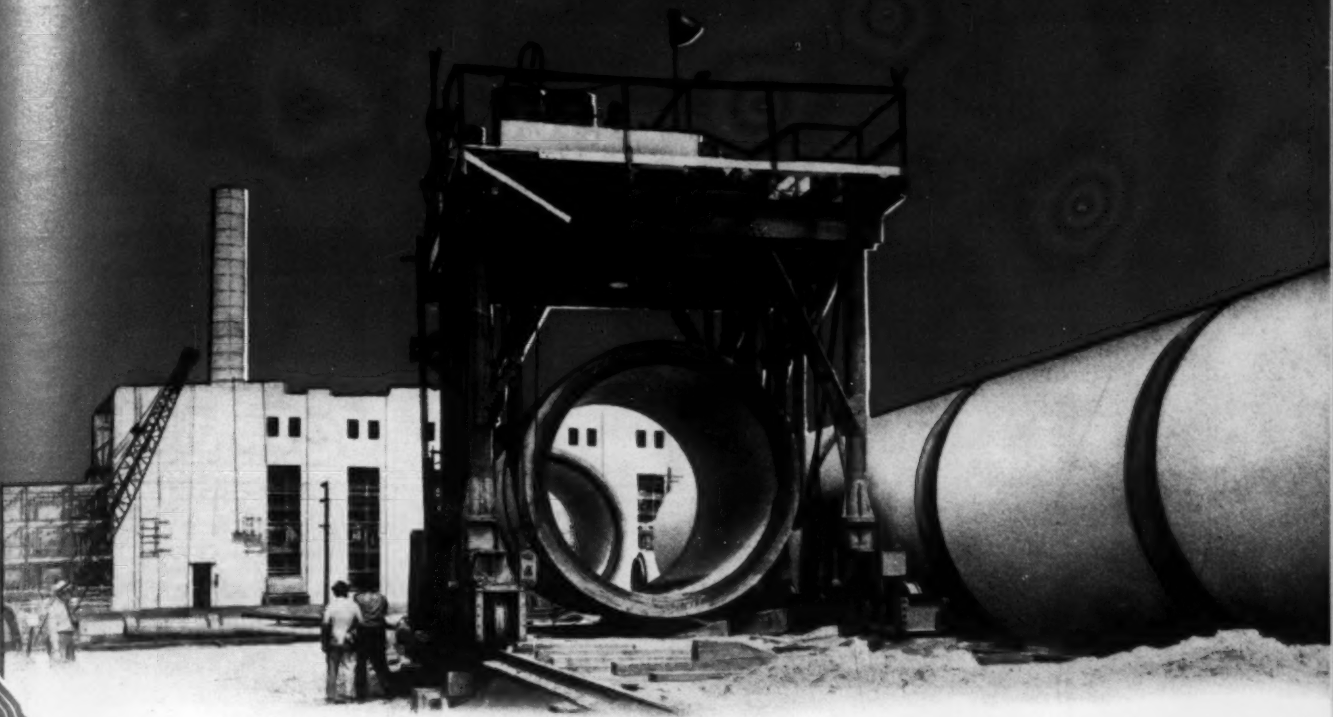
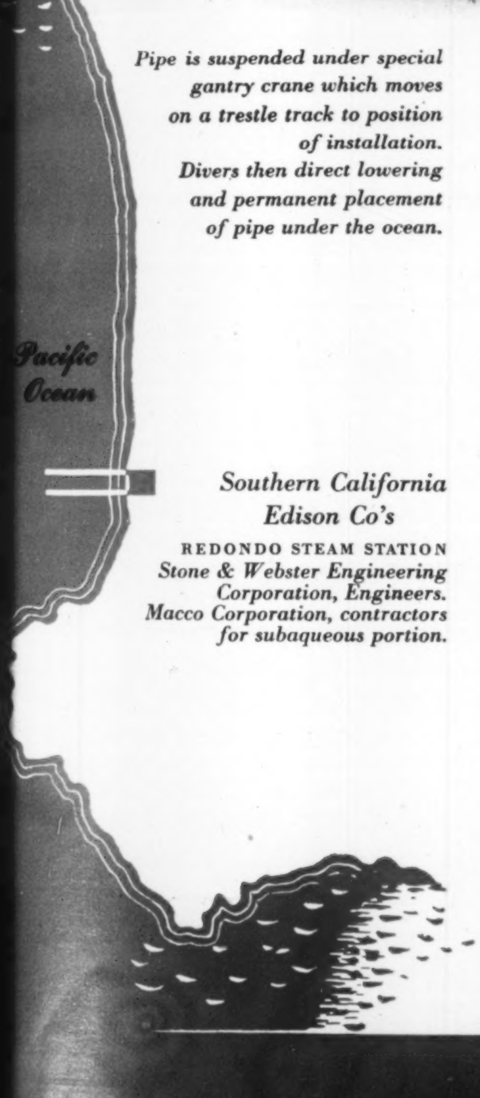
Wright, Frank Donald (Jun. '47) 908½ East 3 Ave., Broadhead, Wis.

Membership Transfers

Argraves, Newman Edward (Assoc. M. '4 M. '48), (Argraves & Mort), 70 College St., New Haven 10, Conn.

(Continued on page 101)





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ENGINEERS. (*c*) Architect or Architectural Engineer, young, graduate architect or architectural engineer with some experience in industrial architecture. Experience may have been acquired in the architectural department of some industrial organization or in the offices of a consulting architectural firm. Salary, $5,700 a year. Location, Pennsylvania. Y-287.

STRUCTURAL DRAFTSMAN; with experience, to lay out structures, supports, gratings, etc., for steel products manufacturer. Salary, $3,000–$4,000 a year. Location, Tennessee. Y-298.

ENGINEERS. (*a*) Civil Engineer, designer, preferably with 5 to 10 years experience on sewers, water works, highway, etc. Salary, open. Location, Texas. Y-312.

SALES ENGINEER; 25–35, civil or chemical graduate, preferably with bituminous paving experience, to represent company in New York state. Y-313.

ENGINEER; specialized in general laboratory practices, such as concrete, aggregates, asphalt and soil mechanics. Must be able to develop plans for special investigations or to interpret the results of tests in order to recommend specifications or procedures for pavements, foundations, etc. Will be a consultant to laboratory and would include the preparation of personnel. Salary, about $10,000 a year. Location, Venezuela. Y-323.

TECHNICAL EXPERTS. (*a*) Administrator and Superintendent on the construction of residences and office buildings. (*b*) Real Estate Appraiser for both improved and unimproved property. Should have architectural and/or engineering background, practical experience in operations of this character and some language qualifications. Salaries, $6,000–$12,000 a year. Locations, Balkans, Scandinavia, Near East, Far East and Australia. Y-351.

SUPERINTENDENT; electrical, sanitary and civil engineer, with some experience and/or training in these fields in addition to some administrative experience is desirable. Work will include complete survey of sewerage and sanitation facilities; location of supplementary or new source of water supply; supervision and improvement of power transmission of purchased power through village-owned lines, with possibility of rate adjustment through rate studies. Write stating personal, educational and experience data. Location, Ohio. Y-366.

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E, WALTER LEON (Jun. '38; Assoc. M. '47)
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AN, CODY SYLVESTER (Assoc. M. '21; M. '47)
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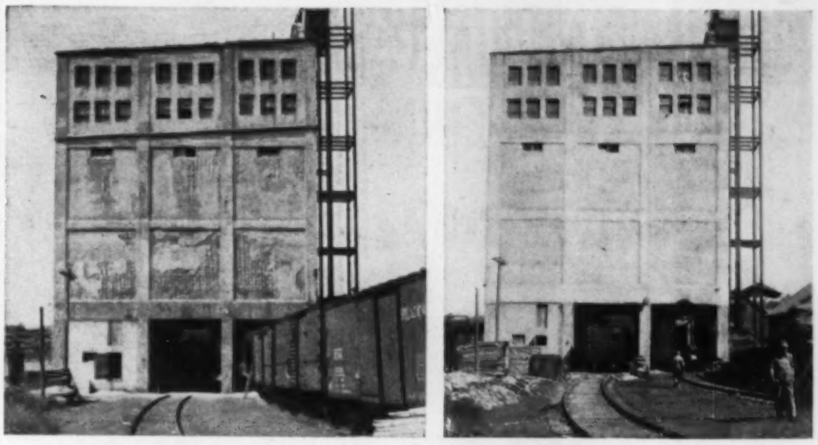

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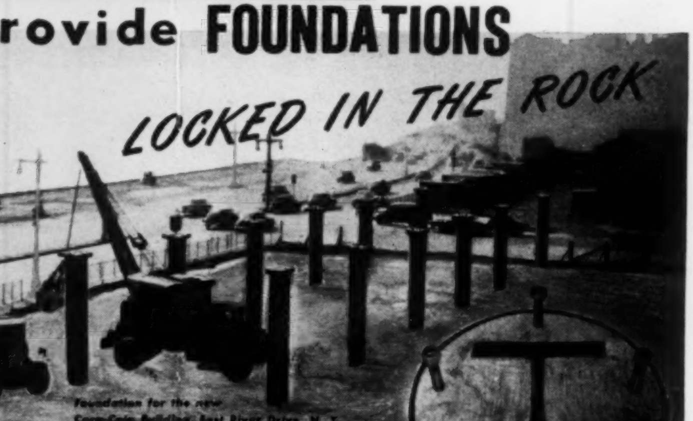

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A Suggestion to Civil Engineers in Industry . . .

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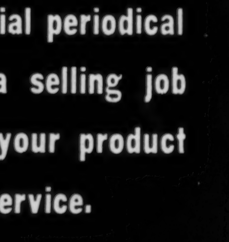


CIVIL ENGINEERING
PUBLISHED BY THE AMERICAN SOCIETY OF CIVIL ENGINEERS
33 West 39th Street, New York 18, N. Y.

ROBINSON, ERNEST LEFFERT (Assoc. M. '19; M. '48) Structural Engr., Turbine Eng. Divs., General Electric Co., Schenectady 5, N.Y.

ROLLER, CHARLES ELMER, JR. (Jun. '37; Assoc. M. '47) Asst. Engr., John P. Hallahan Co., 1602 Finance Bldg. (Res., 369 East Gowen Ave.), Philadelphia 19, Pa.

RUTTER, MARTIN LUTHER (Jun. '40; Assoc. M. '48) Comdr., CEC, U.S.N., Naval Research Laboratory (Res., 1130 Chaplin St., S.E.), Washington 19, D.C.

SHEEHY, JOHN EDWARD (Jun. '39; Assoc. M. '47) Civ. Engr., Fred J. Early, Jr., Co., Inc., 369 Pine St., San Francisco (Res., P.O. Box 372, Los Altos), Calif.

SKINNER, COLIN O'NEAL (Assoc. M. '29; M. '47) Technocal, 1646 Victory Blvd., Glendale (Res., 1620 Winona Ave., Burbank), Calif.

TAN, ENG JOO (Jun. '43; Assoc. M. '47) Managing Director, (E. J. Tan Eng. Co., Ltd.), 6 Raffles Quay, Singapore, Straits Settlements.

WHITNEY, EDWARD NELSON (Assoc. M. '30; M. '48) Civ. Engr., New York Board of Water Supply, 120 Wall St., New York 5, N.Y.

WU, HANG-MIEN (Jun. '36; Assoc. M. '47) Director, Nanking Municipal Waterworks Administration, 45 Kung Yuan St., Nanking (Res., 6 Ramos Apt., 2081 North Szechuen Rd., Shanghai), China.

Reinstatements

BARNES, JACK YALE, Assoc. M., Mason City, Iowa, reinstated Feb. 2, 1948.

BIRNBAUM, ARTHUR, JUN., 1072 Fiftieth St., Brooklyn, N.Y., reinstated Feb. 2, 1948.

CLARE JIMENEZ, MANUEL EMILIO, Assoc. M., With Cia Constructora Clare Hnos, Ltda., Apartado 175 (Res., P.O. Box 175), San Jose, Costa Rica, reinstated Nov. 17, 1947.

DUFFEE, LOUIS WARREN, Assoc. M., 1285 Oxford Road, N.E., Atlanta, Ga., reinstated Jan. 28, 1948.

EGBERT, DONALD CARLYLE, Assoc. M., City Mgr., City of Birmingham, Municipal Bldg., Birmingham, Mich., reinstated Jan. 7, 1948.

FIXEN, VICTOR LEROY, M., R.R. 2, Mound, Minn., reinstated Jan. 15, 1948.

FOWLKES, BENJAMIN COBB, JR., Assoc. M., Col. Corps of Engrs., U.S. Army, Engr. Section, 6th Army, Presidio of San Francisco, Calif., reinstated Jan. 7, 1948.

HAND, RICHARDSON, Assoc. M., 70 West Union St., Wilkes-Barre, Pa., reinstated Jan. 7, 1948.

HOFFMAN, DON MARION, Assoc. M., Cons. Civ. Engr., Placerville, Calif., reinstated Jan. 12, 1948.

KUYKENDALL, AUBRAY LEON, Assoc. M., 4300 Emerson St., Dallas 5, Tex., reinstated Jan. 7, 1948.

PONTZ, HARRY ARTHUR, Assoc. M., Cliveden Constr. Co., Inc., 18 West Chelton Ave., Philadelphia, Pa., reinstated Jan. 15, 1948.

RANTZ, SAUL EDWARD, Assoc. M., Associate Hydr. Engr. (P-3), U.S. Geological Survey, 702 Appraisers Bldg., San Francisco (Res., 1487 Sylvia Way, San Leandro), Calif., reinstated Dec. 10, 1947.

SHIELDS, THOMAS GEORGE Jun., 1408 South 9th Ave., Maywood, Ill., reinstated Jan. 14, 1948.

VAN SISE, ANDREW JACKSON, Assoc. M., 546 Marion Park Drive, Clear Lake, Iowa, reinstated Feb. 2, 1948.

VARKER, WILLIAM METCALF, Care M., D. M. Mc Bean, Inc., Cons. Engr., 61 West 56th St., New York 19, N.Y., reinstated Jan. 30, 1948.

Resignations

ALLISON, ALEXANDER, JR., Jun., 128 Butterfield Rd., San Anselmo, Calif., resigned Jan. 7, 1948.

BESSE, IRVIN KENT, Jun., 23 Columbus Ave., Beverly, Mass., resigned Jan. 14, 1948.

BLAKEMAN, HERBERT EDWARD, Jan., 16 College Apts., Grand Island, Nebr., resigned Jan. 8, 1948.

BURA, JOHN, Jun., 2354 Twenty-seventh St., Astoria 5, N.Y., resigned Jan. 9, 1948.

CAMPBELL, ROBERT RUSSELL, Assoc. M., 44 Orris St., Melrose Highlands, Mass., resigned Jan. 7, 1948.

CLARKE, GEORGE ARTHUR, Jun., Box 25, Harrison, Nebr., resigned Jan. 12, 1948.

CLIFT, CARL EDWARD, JR., Jun., 204 Morningside Drive, Chattanooga, Tenn., resigned Jan. 14, 1948.

DALLAS, ALEXANDER FRASER, Jun., 95 Clinton Rd., West Caldwell, N.J., resigned Jan. 16, 1948.

DAWSON, JOHN ROBERT, SR., Assoc. M., 321 La Salle Ave., Hampton, Va., resigned Jan. 19, 1948.

DEWITT, LYLE VINSON, Jun., 1420 West Riverview St., Decatur, Ill., resigned Jan. 14, 1948.

DIFFENDERFER, JAMES WILSON, JR., Jun., 601 Montgomery St., Logansport, Ind., resigned Jan. 2, 1948.

DOUGHERTY, NATHAN SAMUEL, Jun., 1708 Yale Ave., Knoxville 16, Tenn., resigned Jan. 12, 1948.

EFFENBERGER, EWALD JOSEPH, Jun., Box 27, Victoria, Tex., resigned Feb. 2, 1948.

idge, Albert Matthews, Assoc. M., 1509 on Lane, Austin, Tex., resigned Jan. 9, 1948.

Carl Stephens, M., 360 Huntington Ave., ton, Mass., resigned Jan. 8, 1948.

tt, Thomas Colgate, Jun., Peoples National nk Bldg., Lynchburg, Va., resigned Jan. 16, 1948.

son, Edwin Milton, Jun., 7709 Fourth Ave., 3C, Brooklyn 9, N.Y., resigned Jan. 7, 1948.

laender, Hermann, Assoc. M., 410 West St., Seattle, Wash., resigned Jan. 12, 1948.

William Arthur, Jun., 60 Brookside Ave., 2A, Somerville, N.J., resigned Jan. 14, 1948.

ith, James Rinaldo, M., Care, Birch-John-Lytle, P.O. Box 1949, Seattle 11, Wash., resigned Jan. 7, 1948.

s, Charles Edward, M., 435 Kensington Rd., t Lansing, Mich., resigned Jan. 8, 1948.

, Brent Cooke, M., 205 North Mountain St., City, Mich., resigned Jan. 21, 1948.

rsen, Robert John, Jun., 708 North Prospect Ypsilanti, Mich., resigned Jan. 16, 1948.

, LaVergne Claude, June., 951 East 6th Ave., Denver, Colo., resigned Jan. 14, 1948.

, Frank Warren, Jun., 129 West 7th St., Hutchinson, Kans., resigned Jan. 16, 1948.

, Longley Reed, Jun., College of Eng., Univ. Arkansas, Fayetteville, Ark., resigned Jan. 30, 1948.

, Arthur, Assoc. M., Barkhamsted, Conn., resigned Jan. 7, 1948.

ar, Frank Miles, M., R.F.D. 2, Allendale, N.J., resigned Jan. 16, 1948.

ie, Joseph Sioussa, Assoc. M., 1303 Singer Pittsburgh, Pa., resigned Jan. 13, 1948.

der, Ivor Tulk Chesson, Assoc. M., Fraser-Brace Ltd., Royal Bank Bldg., Montreal, Que., Canada, resigned Jan. 13, 1948.

hall, Leon Craig, Assoc. M., 59 Rumford Concord, N.H., resigned Feb. 2, 1948.

in, James William M., 28 South Daisy Ave., Long Beach 2, Calif., resigned Jan. 2, 1948.

en, James McLean, Jun., 4560 Horton St., Emeryville, Calif., resigned Jan. 7, 1948.

ahl, Malcolm, Jun., 2308 Hollywood Blvd., Hollywood, Fla., resigned Jan. 7, 1948.

comb, John Lloyd, M., University Station, Charlottesville, Va., resigned Jan. 14, 1948.

rson, George Leonard, Assoc. M., Mountain Home, Ark., resigned Jan. 13, 1948.

, Herrmann Frederick, Assoc. M., 445 First Westfield, N.J., resigned Jan. 5, 1948.

an, James Porter, Jun., Richardson, Tex., resigned Jan. 19, 1948.

hase, Roy Wade, Jun., 2713 Lincoln Ave., Highland, Ind., resigned Jan. 9, 1948.

om, John Gray, Assoc. M., U.S. Geological Survey, Box 133, Rolla, Mo., resigned Feb. 2, 1948.

rs, James Louis, Jr., Jun., 123 Florence Ave., Hempstead, N.Y., resigned Jan. 2, 1948.

, Arthur Frederic, Jun., Care, Azusa Food Lockers, 777 North Vernon Ave., Azusa, Calif., resigned Jan. 8, 1948.

, David Gerson, Jun., 30 Sea Gate Terrace, Brooklyn 24, N.Y., resigned Jan. 2, 1948.

gers, Arthur M., 1629 Filbert Court, Denver 7, Colo., resigned Jan. 12, 1948.

lson, Hyman, Jun., 4712 Avenue "G," Austin, Tex., resigned Jan. 7, 1948.

an, William Davis M., 774 Forest Ave., Glen Ellyn, Ill., resigned Jan. 2, 1948.

, Leon Theodore, Jun., 309 Buena Vista Ave., Albuquerque, N. Mex., resigned Jan. 16, 1948.

er, Theodore George, Jun., Box 375, Bethpage, N.Y., resigned Feb. 2, 1948.

wart, William Paul, Assoc. M., 535 West Clapier St., Philadelphia 44, Pa., resigned Jan. 7, 1948.

ng, Vincent Reynolds, M., Box 125, La Camada, Calif., resigned Jan. 14, 1948.

Townsend, Henry McDonald, Assoc. M., U.S Geological Survey, 1109 North Highland St., Arlington, Va., resigned Jan. 20, 1948.

, Ronald Jocelyn, Jun., Route No. 5, Napoleon, Ohio, resigned Jan. 14, 1948.

Van Horn, Maynard Duane, Jr., Jun., 136 Iroquois Court, Lexington 10, Ky., resigned Jan. 8, 1948.

Van Tuyl, Roderick, Jun., North Rd., Greenport, N.Y., resigned Jan. 7, 1948.

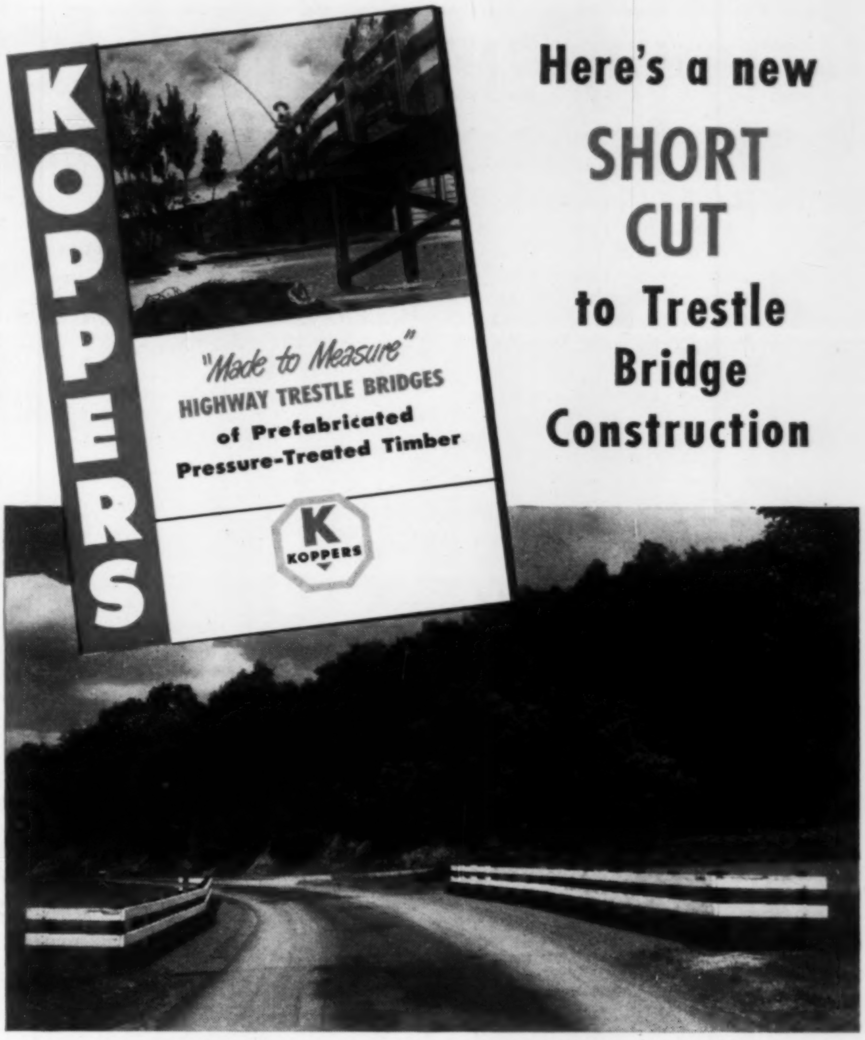
Walker, Eldred Herbert, M., 25 Leander Rd., Rochester 12, N.Y., resigned Jan. 8, 1948.

rop, Marshall Ray, Jun., 230 Reed St., ding, Pa., resigned Jan. 8, 1948.

, Clifford Riddle, M., 1760 Euclid St., N.W. Apt. 605, Washington, D.C., resigned Jan. 16, 1948.

t, Earl Shaward, Assoc. M., P.O. Box 2005, Louisville, Ky., resigned Jan. 7, 1948.

Yorke, Robert Bruce, Jr., Jun. 140 Greenwood Rd., Sharon Hill, Pa., resigned Jan. 9, 1948.



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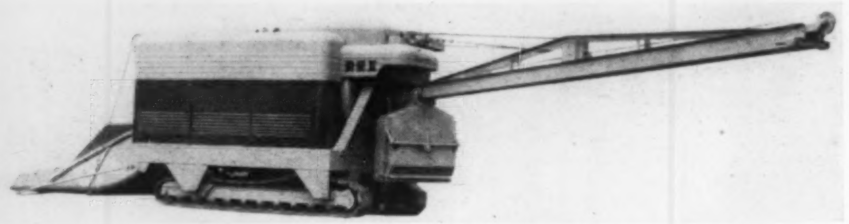
EQUIPMENT, MATERIALS *and Methods*

NEW DEVELOPMENTS OF INTEREST, AS REPORTED BY MANUFACTURERS

Pavers

NEW REX PAVERS are now in production. A streamlined shielding houses the entire paver body. The streamlining affords protection to all working parts and is said to offer greater ease of accessibility to working parts through large, easily operated doors. A mechanical, completely automatic innovation called "Hydrocycle Control" permits the operator to sit comfortably and operate the paver at top speed. It combines the timing of the batch with the timing of the complete paving cycle. It automatically starts the discharge, starts the skip, turns on the water, turns it off, closes the discharge chute, and operates the transfer on the double drum design. The operator thus has more time to lower the skip, spread the batch, or move the paver. Among the many other features of the new pavers are improved visability, extra wide unobstructed skip with truck stops, and greater stability. **Chain Belt Company, 1600 West Bruce St., Milwaukee 4, Wis.**



◆

Powerful Crawler Tractor

THE INTERNATIONAL TD-24, called the most powerful crawler tractor on the market, is now in production. Its weight is 36,275 lb not including fuel, water, attachments or dunnage. Additional weight with fuel tank and radiator filled but without attachments brings the total to 37,178 lb. Entirely new, including its 6-cylinder, 4-cycle, 180-hp diesel engine, the tractor is said to offer cost-cutting power for big projects and to be as easy to control as a modern automobile despite its great size and horsepower. Among the features that are said to provide advantages in operation and power application are: push-button, all-weather starting with the International inbuilt gasoline conversion starting system; tip-toe engine clutch control, hydraulically boosted; eight speeds forward and eight speeds in reverse; easy, on-the-go gear shifting by means of synchromesh transmission and instant high-low range shift; quick forward-reverse shift in any traveling speed by means of separate shift lever; planet-power steering under finger-tip control with new hydraulic system permitting gradual turns with both track pulling, or pivot turns with one track locked and the other track under full power.

Designed for high-speed operation as well as for tremendous pull, the new track frame assembly has taper-roller-bearing in track rollers and front idlers; new type idler recoil spring; one-piece, welded track frame; roomy, comfortable seat; centrally located controls and increased visibility; and a needle-bearing universal joint compensating for any mis-alignment and permitting mounting of heavy equipment on front of the tractor. A complete line of matched tractor equipment is available for the TD-24. **International Harvester Co., Chicago, Ill.**

Sealz-Melter

IMPROVED EQUIPMENT for melting and pouring permanent seals in highway and airfield runway joints has been developed. The new melter device was designed for use with Sealz, a rubber compound that permanently seals joints in concrete. It is of the double-boiler type, one chamber inside the other, and it is oil heated to 450 deg automatically controlled at that temperature. This principle prevents overheating and damaging the Sealz compound which is loaded into the inner chamber which holds three 50-lb bags of the material. The melter operates on a continuous cycle, 50 lb being added and withdrawn every twelve minutes. Heat is supplied by burning gas from pressure cylinders while the contents are agitated continuously with a stirrer driven by a gasoline motor. Melted Sealz is withdrawn through a fully insulated valve seated in the oil bath chamber The total weight of the Sealz-Melter is 1,150 lb. **United States Rubber Company, Rockefeller Center, N.Y.**

◆

Widening Finisher

AN IMPROVED MODEL of a widening finisher is announced. Features of the improved model are: a unit automotive type transmission with all parts running in oil, an oversize ball bearing clutch, and a simplified shoe steering device. The machine is of the single screed type with widths adjustable from 2 to 6 ft by changing the screed wings. It is equipped with forward traction speed suitable for all normal work, one high reverse speed, and two screed speeds to accommodate concrete of different textures. **Blaw-Knox Co., Blawnox, Pa.**

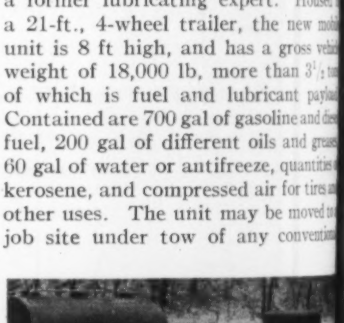
Dozer Blades for TD-24 Tracto

HUGE NEW BULLDOZER and trailbuild blades have been designed to match th style and stamina of International's re cently announced most powerful crawl tractor, the TD-24. The bulldozers hav fixed straight-ahead blades scientifical curved to "roll" the earth ahead of the They are over 10 ft wide, 4 ft high, a weigh over 3 tons. Fast-acting, cab controls drop the blade to unlimited di ging depth and raise it up to 4 ft abo ground. Trailbuilders for the gia tractors are dozers which may be adjust to provide slanted pushing drive and ro ing action for side banking and gradin They are almost 14 ft wide, 44 in. hig and weigh over 4 tons. Down action the blades is unlimited and cable cont units lift them 50 in. above ground. T use the tremendous power supplied by th TD-24, a new cable power control un has been designed. It is a rugged un that provides greater cable pull with percent less operator effort than previo models. **The Heil Co., Milwaukee Wis.**

◆

Portable Service Station

KILROY, a portable service station c pable of completely servicing mechaniz units operating on heavy constructi jobs, is the invention of John H. Ade a former lubricating expert. Housed i a 21-ft., 4-wheel trailer, the new mobi unit is 8 ft high, and has a gross vehic weight of 18,000 lb, more than 3½ to of which is fuel and lubricant paylo Contained are 700 gal of gasoline and dies fuel, 200 gal of different oils and greas 60 gal of water or antifreeze, quantities o kerosene, and compressed air for tires an other uses. The unit may be moved to job site under tow of any conventio truck type tractor. Coupling or unc pling is quickly made, thus freeing the tra tor for other use. According to the un inventor, Kilroy may be considered three independent parts. Central por of the machine is made up of the fuel ta built into the channel members and tra chassis. On each side of the tank assem is a battery of nine hose reels for dispe ing diesel fuel, gasoline, water, diesel l oil, gasoline lube oil, air, chassis gre track roll, and gear oil. The unit wil produced by **Jax, Inc., 4925 Friend Ave., Pittsburgh, Pa.**



Self-Wiping Reflecting Roadstud

A NEW HIGHWAY safety device is making its appearance on the highways in the eastern United States. It is a self-wiping, reflecting roadstud, trade name, "Catseye." Each "Catseye" has two reflecting lenses housed in a highly resilient bridge-shaped rubber pad which clips into a box-shaped metal base with ramps to protect the pad. This metal-based box is paved in the center of the highway where the lights of automobile headlamps are reflected from the "Catseye," thus marking a definite lighted center line for traffic. Vehicles whose wheels run over the stud depress the rubber pad containing the lens and, in the process of depression and rebound, the lens come in contact with stationary wipers and are cleaned of mud and dirt. The "Catseyes" are said to be highly effective in fog and rain, giving the motorist a lighted center line of travel from 50 to 100 yd in any fog condition, and 1,000 ft on clear nights. The roadstuds can be fixed into all existing roads and can be readily installed in new construction at a nominal cost. **Highway Safety Co., Inc., Frederick, Md.**

◆

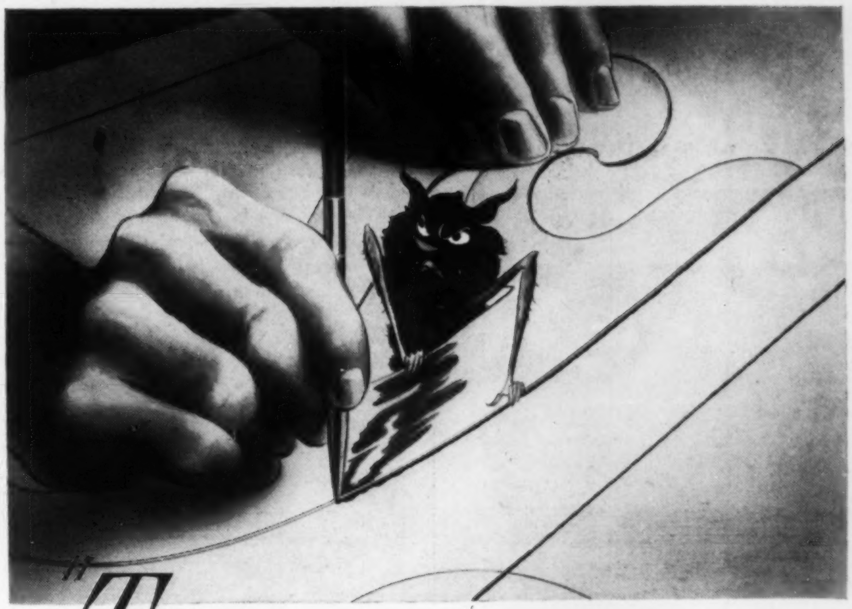
Adjustable Troughing Idler

AN ADJUSTABLE troughing idler designed to increase the life of conveyor belts is now on the market. Outer inclined pulleys are adjustable from slightly above the horizontal up to an angle of 25 deg. All idler pulleys are located in the same vertical plane and the adjustment of the outer pulleys is accomplished in a manner which maintains a constant gap between the ends of the horizontal and inclined pulleys. This gap is kept to a minimum to eliminate any possibility of the belt being damaged due to creasing or pinching at such points. Some materials do not require as deep a trough as that given by the standard 20°-troughed idlers, and this idler design can be used in such cases to provide any suitable depth of trough. Suitable for use at locations on conveyors where any inclined belt changes to a horizontal path, the idler accomplishes this change in belt direction by use of a flat bend pulley, or by a number of adjustable idlers arranged to form a vertical curve and provide the shallowest trough necessary to retain the material without spill. The belt is thus allowed to be troughed or flattened gradually and the abrupt distortion of belt is eliminated. **Koppers Co., Inc., Pittsburgh 19, Pa.**

◆

Electric Eraser

FOR THE DRAFTING room, a Handee electric eraser has been developed. Balanced and shaped to fit the hand, it is said to handle with pencil-point precision. The total weight is but 12 ounces. All moving parts except the rubber eraser are completely covered by the protective sleeve fully protecting the fingers. The eraser chuck accepts any of the standard erasers, and is said to give sharp, keen erasings. **Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago 7, Ill.**



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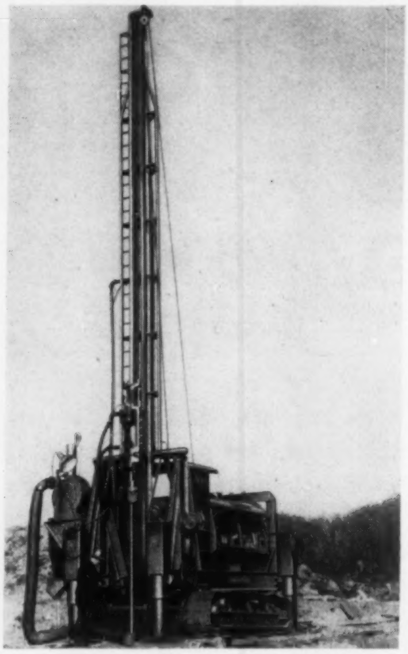
The Quarrymaster

A SELF-PROPELLED rock drill designed for strip, open pit mining and quarry work is announced by Ingersoll-Rand. Known as the Quarrymaster, this machine is a completely self-contained unit consisting of a drill, compressor plant, propulsion equipment, and accessories. Said to be capable of drilling at a faster rate than conventional machines and to be easily maneuverable, the Quarrymaster collars a hole with ease, and drills holes up to 6 in. in diameter and up to 70 ft in depth.



Mounting an air-operated, piston-type rock drill that strikes more than 200 blows per min, the Quarrymaster has a high rate of rock penetration. A patented valve action and power cycle insures maximum efficiency and drilling speed, while maintenance is reduced by utilizing a cushion of air to bring the piston to rest before it can strike the front head. Feeding of the drill is accomplished by an air motor which drives the feed chain. A conveniently located throttle allows the operator to exert accurate control over the drill feed, a feature which is particularly valuable in drilling through slips and seams where a close degree of regulation is necessary. A drill-steel centralizer guides the drill steel until the bit is well started, permitting quick and easy collaring of holes in the most uneven ground. Bits used are light in weight, long-wearing, and are easily changed. In drilling, the bit is automatically rotated by a mechanism which turns it into a fresh cutting position for each blow. The amount of rotation is controlled, making the Quarrymaster a rock-cutting rather than a rock-crushing machine. Chips are removed by passing compressed air down through the hollow drill steel, forcing the cuttings up to the surface through the space between the steel and the walls of the hole. When the cuttings reach the surface, they are gathered by a motor-operated dust collector. This

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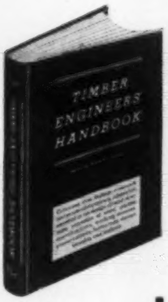

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method of removing cuttings permits the bit to strike a clean surface with each blow, so that no power is lost in drilling through previously cut material. Air is supplied by a Mobil-Air compressor mounted on the frame. Mounted on generously sized crawlers, the Quarrymaster is readily moved. Extremely sensitive to control, it can be spotted in the exact position desired and can be moved up a 30 percent grade. Leveling is accomplished by four independently controlled hydraulic jacks, allowing a time saving of 15 to 20 percent of that required for conventional machines. The tower of the machine can be raised or lowered intact by utilizing the power of the feed motor. **Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.**

◆

Heavy Duty Crushers

THE PROCESS MACHINERY DIVISION of Nordberg Manufacturing Company, Milwaukee 7, Wis., is now in production of a broad line of heavy primary crushing and grinding machinery for the reduction of rock products, ores and non-metallic minerals for basic industries.

Primary Jaw Crushers are available in the larger sizes from 30″ × 42″ up to 72″ × 96″; Primary Gyratory Crushers in sizes from 30″ up to 72″, and Grinding Mills from 6′ to 10′ 8″ in diameter and up to 50′ in length. Rotary Dryers, Calciners, Kilns, and Coolers are also available.

This additional line of reduction and processing equipment supplements the well-known universally used line of Symons Cone Crushers manufactured by Nordberg. **Nordberg Mfg. Co., Milwaukee 7, Wis.**

◆

Vertical Gearmotor

SELF-CONTAINED vertical gearmotors are available in 3 to 50-hp, 220, 440, or 550-volt, 3-phase, a-c, and 3 to 7$^1/_2$-hp, 115 or 230-volt, d-c. They may be equipped with practically any standard motor in a variety of enclosure types including: open protected, semi or totally enclosed and explosion proof. Special features of the vertical gearmotor are: The design of the gear case is such that all gears and bearings receive positive lubrication at all operating speeds, quiet operating, single helical gears and pinions of 40 to 50 carbon steel are given the "tough-hard" heat treatment before hobbing, maximum strength and tooth overlap; uniform loading, uniform wear, and lower impact stresses from sudden shocks or reversals. **Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.**

◆

Kay-Tite

KAY-TITE, a portland cement based membrane coating used for curbing water and moisture penetration in porous masonry structures is now available in seven colors besides white and gray. The main objective of this new color addition is to meet the request of architects and engineers to blend Kay-Tite with existing color schemes **The Kay-Tite Co., West Orange, N.J.**

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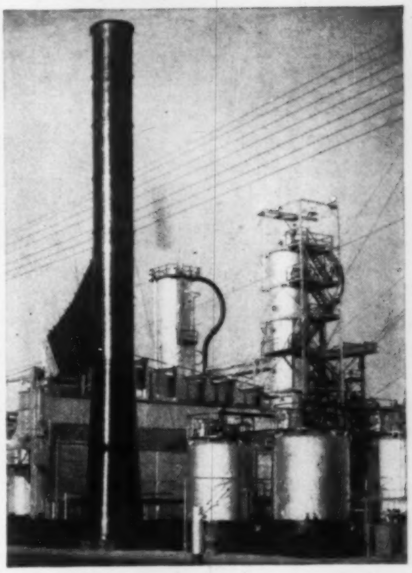

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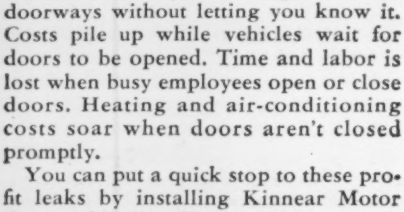

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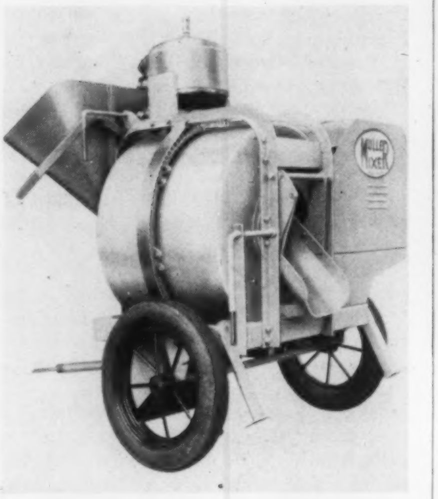

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A complete new line of hydraulic products is now on the market, including hydraulic pumps, motors, valves, cylinders, and a compact 3-in-1 power unit which incorporates in one design a pump, control valve, and reservoir. Pumps, motors, and power units are available in four sizes—15, 25, 40, and 60 gpm. Cylinders are available in three sizes—4 in., 5 in., and 6 in. diameters. Valves come in two sizes for control of flows up to 50 gpm and 70 gpm. Pumps and motors include such design features as interchangeable spur-type gears, needle roller bearings, positive lubrication, and bronze reversible thrust plates. Designed for automotive, portable, or stationary installations, the pumps may be electric motor or engine driven. The power unit incorporates some revolutionary principles such as surge control, a supercharged pump, and small capacity reservoir. Valves are spool-type, three positions, and self-centering. Cylinders are double acting and can be mounted in any position. The new hydraulic line is for use on any type of machinery. **Laplant-Choate Manufacturing Company, Inc., Cedar Rapids, Iowa.**

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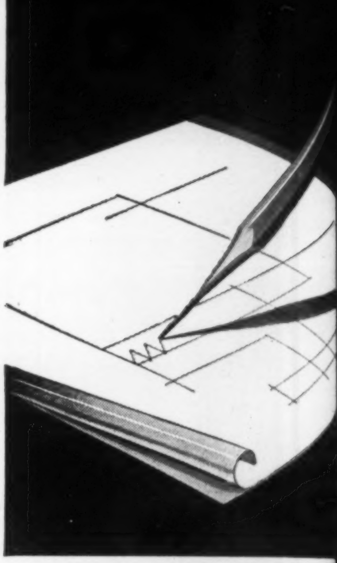

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◆

SEL OPERATION—Publication of a ge booklet entitled, "The Lanova ustion System for Diesels" is an- ed. Written in non-technical lan- and profusely illustrated, this book- vides a manual on diesel engine per- nce for engineers and non-engineers Points that are discussed are com- ns between types of fuels, differences en internal and external combustion es, and gasoline and diesel engines, ll as a full description of how a diesel tes. In presenting the subject of ustion, the booklet illustrates and ses representative types of diesel ustion systems. An appendix of eering tables and data is also in- d. **Lanova Corp., 38-15 30th St., Island City 1, N.Y.**

TOELASTICITY POLARISCOPES—The e, illustrated booklet describes ap- s used for obtaining experimental ns to problems of stress distribu- n mechanical parts and structures. ludes optical diagrams and specifica- covering three sizes of assemblies her with descriptions of various use- ccessories. **The Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.**

VIBRATORS—An illustrated four-page folder sets forth pertinent data on inter- eable vibrator units, flexible shaft tors, and a full depth internal ete paving vibrator. Specifications rning speeds, weights, sizes, types wers, etc., are included. **Viber Co., 728 S. Flower St., Burbank, Cal.**

WIRE ROPE MANUFACTURE—A new, 56- booklet entitled "Life-Line," shows various processes of manufacturing rope from wire rods through wire rope mills. The story is presented in es with short captions in a manner r to a strip film. **Macwhyte Co., sha, Wis.**

UTILITY PUMP—Four self-priming port- pumps expressly designed for utility any maintenance work are described bulletin just released. The bulletin ins performance tables, based on tests, stating the efficiency of each at heads from 15 to 70 ft. Sizes of portable units, weight ranges, and requirements are also included. **Marlow Pumps, 229 Greenwood Ave., Ridgewood, N.J.**

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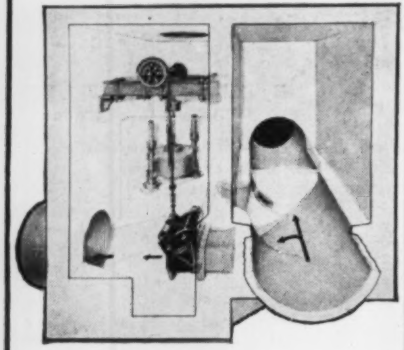

Fig. B-19

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Literature Available (Cont.)

Axiflo Fans—The performance of the new line of Axiflo fans suitable for high temperature applications is outlined in an eight-page booklet released by the Westinghouse Electric Corp. Complete with pictures of the various models available in either the elbow or straight-through type, the booklet describes how the unique cone arrangement and other features including low maintenance and ease of installation make these positive pressure fans suitable for such applications as air conditioning systems, heating and ventilating, dust and fume removal, equipment and machinery cooling, heat treating nonferrous metals, and industrial drying and processing. Characteristics and special advantages of each are listed. **Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.**

Engineering Equipment—Civil Engineering equipment, manufactured by Cooke, Troughton & Simms, Ltd., of York, England, is described in the following brochures: Vernier and Micrometer Theodolites, Cooks Optical Clinometer, Engineers' Block Levels, Geodetic Level, Theodolite T 63, The Tavistock Theodolite, Surveyor's Level, and Engineer's Level. Descriptions, illustrations, and diagrams explain design, specifications and special attributes of the various instruments. Requests for any of the above folders to: **The R. Y. Ferner Co., 110 Pleasant St., Boston 48, Mass.**

Neoprene—Facts for the engineer about Neoprene hose are set forth in an eight-page folder by means of description, tables, charts and illustrations. Among the described uses for Neoprene are: bender for flexible grinding wheels, underground cables, resilient pads to control vibration, coated wire rope, and pipe wipers. **Rubber Chemicals Div., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.**

Standardized Steam Turbine Units—According to company officials, orders placed indicate a general acceptance of the preferred AIEE-ASME standards for steam turbine and generator units larger than 10,000 kw. These standards, covering ratings and characteristics, were developed through collaboration between power companies, consulting engineers and turbine manufacturers. Allis-Chalmers' part in this long-range program is told in a detailed bulletin. Carrying illustrations of models of six sizes of standardized units, as well as cross section drawings, the 16-page bulletin furnishes data on their ratings, capability and pressure and temperature limitations. The bulletin also lists the features and accessories to be furnished with the standardized turbine, the air-cooled and the hydrogen-cooled generators, and concludes with a description of the standardized units' excitation system. **Allis-Chalmers Mfg. Co., Milwaukee, Wis.**

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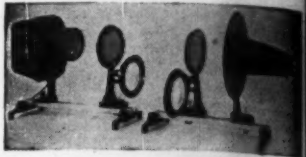

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